B4800-1A

NUEXCO

AUGUST 1986 NUMBER 216

MONTHLY REPORT

ON THE NUCLEAR FUEL MARKET

NUEXCO

Three Park Central 1515 Arapahoe Street, Suite 1045 Denver, Colorado 80202

HEADQUARTERS

Chairman of the Board of Partners
Oren L. Benton

Vice Chairman of the Board of Partners and Chief Executive Officer
Samuel R. Freeman

Directors of Operations
Business and Financial Affairs — James E. Lewis
Administration — J. Fred Lawrence
Legal and Regulatory Affairs — Frederick J. Boyne

NUEXCO FUEL BROKERAGE SERVICES

Manager of Fuel Brokerage
Earl E. Hoellen, Jr.

BROKERAGE SERVICE LOCATIONS

UNITED STATES

DENVER
Three Park Central
1515 Arapahoe Street
Suite 900
Denver, Colorado 80202
Telephone: (303) 893-4015
Telecopy: (303) 825-4821
Telex: 450202 (NUEXCO DVR)

Managing Broker
Earl E. Hoellen, Jr.

MENLO PARK
Bldg. 3, Suite 290
3000 Sand Hill Road
Menlo Park, California 94025
Telephone: (415) 854-1510
Telecopy: (415) 854-2115
Telex: 470674 (NUEXCO UI)

Managing Broker
George White, Jr.

EUROPE

FERNEY-VOLTAIRE
13 chemin du Levant
01210 Ferney-Voltaire
France
Telephone: (33-50) 428035
Telecopy: (33-50) 428526
Telex: 385288 (NUEXCO F)

Managing Broker
James E. Vaughan

ZURICH
135 Zurichstrasse
CH-8700 Kusnacht
Switzerland
Telephone: (41-01) 910-8977
Telecopy: (41-01) 910-6672
Telex: 58877 (COMAG)

Managing Broker
Donald P. Ebright

REGIONAL MANAGING BROKERS

AFRICA
James E. Vaughan

AUSTRALIA
George White, Jr.

FAR EAST
Earl E. Hoellen, Jr.

NORTH AND SOUTH AMERICA
Earl E. Hoellen, Jr.

(See inside back cover for list of Representatives and Consultants.)

NUEXCO

MONTHLY REPORT ON THE NUCLEAR FUEL MARKET

August 1986 No. 216

GEORGE WHITE, JR., *EDITOR* CLARK M. BEYER, *ASSOCIATE EDITOR*

PRICING
Natural Uranium and Conversion 1
Enriched Uranium and SWUs 1
Developments in the US Uranium Producers vs. DOE Lawsuit 2

CURRENT MARKET DATA
Nuexco Market Data Table 3
Prices Expressed in Selected Currencies 4
Recent Transactions 6
Supply and Demand Tables 7

ANALYSIS AND COMMENTARY
Status of DOE's Proposed Enrichment Criteria 12
Nuclear Power Projects After Chernobyl in the Federal Republic of Germany 18

UPDATE
1986 US Nuclear Plant Licensing Progress 22

RECENT DEVELOPMENTS
Australia 23
South Africa 23

RAW MATERIALS
The Rabbit Lake Project 25

HISTORICAL MARKET DATA
Graph of Exchange Value and Transaction Value 32
Historical Exchange Value, Transaction Value and Conversion Value 33

GOVERNMENT STATISTICS
Australia 34
Canada 35
South Africa 36
United States 37

NOTICE

This Report is prepared especially for Subscribers and is furnished to them for their use only. Except for internal use by Subscribers, no part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of Nuexco. Neither this Report, nor copies of any portion thereof, may be lent, sold or given to non-Subscribers.

The information in this Report was gathered from sources Nuexco believes to be accurate. However, Nuexco makes no warranty, express or implied, and assumes no legal liability or responsibility for the accuracy, completeness or usefulness of any information contained herein.

© NUEXCO 1986

NUEXCO

To Our Readers

Nuexco would like to announce the centralization of US brokerage operations at its Denver headquarters. This consolidation of our executive, financial, consulting, market research, and legal personnel in Denver will enhance our ability to offer integrated, expanded services such as financing, arbitration, escrow agency, fuel management, etc., in addition to brokerage services. Effective August 4, Earl Hoellen and Bob Alexander, who have been located in Stamford, Connecticut, will move to Denver, where Earl will direct Nuexco's worldwide brokerage operations. All brokers will work closely with Sam Freeman, Jim Lewis, and Fred Boyne in developing and structuring the increasingly complex arrangements required to achieve solutions to the business and marketing problems present in today's environment. In the near future, Don Radcliffe will relocate from our Menlo Park, California office to Denver, where he will also conduct brokerage activities. George White will continue to handle brokerage activities from the Menlo Park office. Brokers will be available in the Denver office from 7:00 a.m. Mountain Time (9:00 a.m. Eastern Time) beginning August 4.

Further, Jerry Reaves, most recently a consultant dealing primarily with US uranium producers, has left Nuexco to pursue other business interests. We wish Jerry the best of luck in his new activities.

* * *

Nuexco will host a hospitality suite during the Uranium Institute's Eleventh Annual Symposium in London, England. The suite will be located at the Savoy Hotel, September 2-4. Nuexco will also host a hospitality suite during the Atomic Industrial Forum Uranium Seminar, September 14-17, at the Jackson Lake Lodge in Grand Teton National Park, Wyoming. We look forward to seeing you at these events.

© NUEXCO 1986

NATURAL URANIUM AND SECONDARY MARKET CONVERSION (All data as of July 31, 1986)

The **Exchange Value** is **$17.00** per pound U_3O_8, unchanged since last month. **Active supply** of natural uranium (concentrates and UF_6) for spot or near-term delivery totals **3,875,000** pounds U_3O_8 equivalent, down 175 thousand pounds since last month. The corresponding figure for **active demand** is **2,700,000** pounds, up 650 thousand pounds. The spot and near-term **supply-demand ratio** fell to 1.4:1.

The *Current Market Data* section of this Report lists seven natural uranium sales, involving approximately 1.2 million pounds equivalent U_3O_8. All of the transactions involved spot or near-term delivery, and six met the criteria for inclusion in the current Transaction Value calculation. Four of the transactions involved natural UF_6.

The **Transaction Value** is **$17.50** per pound U_3O_8, up $0.30 since last month. The substantial rise in the Transaction Value is due to two factors. First, the removal of April transactions, several of which took place at prices below $17.00, contributed to the rise in the value. Also, some of the transactions reported this month involve US-origin material for delivery in 1987, the prices of which reflect both origin premium and escalation factors. The calculation extends over a 3-month period and includes 13 transactions involving 2.5 million pounds equivalent U_3O_8.

The **UF_6 Value** is **$48.25** per kilogram U in UF_6, unchanged since last month.

The **Conversion Value** is **$1.80** per pound U in UF_6, unchanged since last month. Active supply of secondary market conversion services for delivery within three years totals 1.7 million pounds U as UF_6. Active demand totals 565 thousand pounds U as UF_6. No secondary market conversion transactions are reported.

The **Loan Rate** is **4 percent** per annum, unchanged.

* * *

The Exchange and UF_6 Values were unchanged as of the end of July, as little market activity was observed outside the USA. Several US utilities have made purchases or expressed interest in US-origin uranium in the last six weeks, and the premium sought by sellers of US-origin material appeared to increase during early July. However, late in the month the Tenth Circuit Court granted DOE a stay pending appeal of the injunction requiring it to enrich no more than 25 percent non-US origin feed in the second half of 1986. Thus, the ability of US utilities to deliver non-US feed to DOE for enrichment seems secure at least through September 11, the day tentatively scheduled by the Circuit Court for initial hearings of oral arguments.

The market is currently exhibiting a wide range of prices. The chief reason for this situation is the existence of premiums or discounts, depending upon the origin of the uranium, attached to selling prices. A US buyer's inflexibility or need to fill a near-term DOE enrichment requirement may cause it to pay a substantial premium for US-origin uranium, whether by way of swaps or obtained directly from US producers, whose asking prices generally are well above Exchange Value. Those holding substantial US-origin inventories, or confident that no enrichment limitations ultimately will be placed on DOE may choose to continue to buy Canadian or other origin at prices around the Exchange Value. Outside the USA, Southern African-origin uranium is apparently available at prices well below Exchange Value because the political liability has decreased interest in that material except in special circumstances. Thus, the current uranium market appears more sensitive to origin than it has been at any time in the last several years.

Demand increased this month, but much of it is discretionary, as utilities wait to determine the outcome of judicial and legislative proceedings concerning uranium use. There remains a great deal of uncertainty regarding how and when any limitation or embargo might come into effect. The stay granted to DOE in its lawsuit against three US producers has postponed the implementation of restrictions on the enrichment of foreign-origin uranium for use in US plants, alleviating (at least temporarily) some upward pressure on the premium for US material.

The impact of these recent uncertainties concerning the origin of uranium has become apparent in the longer-term market for uranium. US utilities, for the most part, have deferred entering negotiations for long-term supply because of their unwillingness to contract for non-US origin that may be unusable in the future, either because of possible restrictions on the DOE enrichment of that material or because of an embargo on its use in the USA. Moreover, the increasing scrutiny of long-term supply arrangements by public utility commissions has discouraged many US utilities from entering agreements for long-term US uranium supply at prices which are well above current market levels.

* * *

ENRICHED URANIUM AND SWUS

The **SWU Value** as of July 31, 1986, is $78 per SWU, unchanged since last month. This refers to SWU at a tails assay of 0.30 weight-percent U^{235} and for delivery within one year. No secondary market SWU transactions are reported this month.

The secondary market for SWU remains dormant due to the general absence of buyers with near-term needs. Although some USEC holders in the USA were considering non-DOE enrichment as a short-term solution for enriching their non-US mate-

©NUEXCO 1986

rial, the stay pending appeal of the District Court injunction has caused them to postpone or abandon that strategy. Absent those possibilities, the market remains largely inactive.

FURTHER DEVELOPMENTS IN THE US PRODUCER/DOE LAWSUIT

On July 21, the Tenth Circuit Court of Appeals granted DOE's request for a stay of the District Court order entered on June 20, 1986, which required DOE to implement restrictions on the enrichment of foreign-origin uranium for use in US plants until the viability of the US industry is restored. Because the stay was granted, however, Judge J.R. Carrigan's injunction will not go into effect while the appeal in the Tenth Circuit Court is pending.

Carrigan had found that the producers were entitled to relief under section 2201(v) of the Atomic Energy Act. Count I of the lawsuit asserted that DOE had violated that section by not assuring a viable domestic uranium industry. Carrigan then ordered immediate injunctive relief, calling for the provision that 75 percent of the uranium enriched by DOE from June 6, 1986 to December 31, 1986 for use in US reactors must be of US origin; and that as of January 1, 1987, and continuing until the viability of the domestic uranium industry was assured, DOE shall not enrich *any* foreign uranium for use in US reactors.

DOE filed a Notice of Appeal and motion for stay pending appeal (with a memorandum in support of that motion) within several days of the District Court ruling. Observers expected Judge Carrigan to either grant or deny the motion for stay within a few weeks, but as of early July, he had not responded. DOE then took the stay request to the Tenth Circuit Court of Appeals (which has jurisdiction over matters under appeal from the District Court). DOE's application to stay the order was heard by three Circuit Court Judges, who ruled on July 21 that the order is stayed until further order of the Circuit Court.

Furthermore, the Circuit Court ordered that the issues involving Count I should be argued and submitted together with the issues of Count II of the five-count lawsuit, in an expedited hearing on September 11, 1986. Count II pertained to the legality of DOE's Utility Services Enrichment Contract (USEC), which Judge Carrigan ruled to be null and void in September 1985. That issue had been under appeal in the Tenth Circuit Court since then.

DOE's *Memorandum in Support of Motion for Stay Pending Appeal* was reprinted in its entirety on page 10 of Report 215 (July 1986). It argued the rationale behind DOE's motion for stay pending appeal. Among other reasons, DOE stated that

— DOE already had in its possession a high percentage of foreign feedstocks designated for use in US reactors. DOE claimed the order would prevent it from enriching all of the delivered feedstock needed for US reactors. Therefore, domestic utilities and DOE would suffer "irreparable injury without a stay," which "could result in shutdowns of domestic reactors."

—The injunction "impacts adversely on foreign trade, foreign policy, and the nuclear non-proliferation policy of the United States," and is not in the public interest.

The stay pending appeal of the District Court injunction effectively delayed the onset of some potential problems for DOE. At least two US utilities had notified DOE that they intended to deliver non-US origin feed for upcoming enrichment campaigns. If DOE had responded that it could not enrich that material under the terms of the injunction, those utilities may have turned to the secondary market for enrichment or to one of the primary enrichers overseas for that delivery. It is uncertain how many USEC holders would have followed with similar strategies in the next few months if the stay had not been granted, but it is likely that only those with substantial inventories of non-US feed would have responded in that manner.

© NUEXCO 1986

CURRENT MARKET DATA

July 31, 1986	Market Values	Active Supply[1] (thousands)	Active Demand[1] (thousands)
EXCHANGE VALUE	**$17.00**/lb. U_3O_8	3,875	2,700
UF_6 VALUE	**$48.25**/kgU		
CONVERSION VALUE	**$1.80**/lb. U as UF_6	1,700	565
SWU VALUE 0.3 tails assay; delivery within one year	**$78**/SWU		
LOAN RATE	**4%**/annum	0	0

	$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
TRANSACTION VALUE	**17.50**	2.5	13	3

[1]Supply and demand tables in *Current Market Data* section of this Report detail the numbers for each category.

DEFINITIONS

1. The **Exchange Value** is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.
2. The **UF_6 Value** is Nuexco's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.
3. The **Conversion Value** is Nuexco's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.
4. The **SWU Value** represents Nuexco's judgment of the price at which transactions for the sale of significant quantities of SWUs of stated origin for delivery in the specified time period could be concluded as of the date indicated.
5. The **Loan Rate** is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.
6. The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:
   a. Transactions closed within the previous three-month period for which delivery is scheduled within one year of the transaction date;
   b. At least ten transactions;
   c. Transactions involving a sum total of at least 2 million pounds U_3O_8 equivalent.

   The sample time is extended as necessary to include these minima. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

DERIVATIONS AND COMMENTS

1. All Market Values are based on:
   a. Data from recently completed transactions.
   b. Data from pending transactions.
   c. Firm bids to buy or borrow, and firm offers to sell or lend.
   d. Prices purchasers or rates borrowers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy or borrow, and prices sellers or rates lenders have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell or lend.
2. Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these Market Values.
3. In the determination of the Conversion Value, Nuexco does not consider transportation charges other than those customarily provided by primary suppliers of conversion services.
4. The prices of conversion services or SWUs delivered under long-term contracts with primary suppliers are not considered in the determination of either the Conversion Value or SWU Value.
5. For the SWU Value, Nuexco converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U_{235} and a product assay of 3.0 weight-percent U_{235}, assuming feed costs corresponding to the Nuexco Exchange and Conversion Values determined as of the same date.
6. In calculating the Transaction Value, Nuexco does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future Exchange Values or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it cannot currently be determined.

© NUEXCO 1986

NUEXCO

CURRENT MARKET DATA

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	per lb. U_3O_8 in Concentrates			per kg. U in Concentrates		
	This Month (Jul 31, 1986)	Last Month (Jun 30, 1986)	12 Months Ago (Jul 31, 1985)	This Month (Jul 31, 1986)	Last Month (Jun 30, 1986)	12 Months Ago (Jul 31, 1985)
Australia (dollar)	27.96	25.35	21.82	72.69	65.92	56.74
Belgium (comm. franc)	742.68	765.08	893.87	1,931	1,989	2,324
Canada (dollar)	23.51	23.60	21.29	61.13	61.36	55.35
Finland (markka)	85.34	87.13	93.14	221.87	226.53	242.14
France (franc)	116.44	119.30	135.43	302.71	310.15	352.08
FRG (mark)	35.89	37.43	44.50	93.30	97.31	115.70
Italy (lira)	25,648	25,703	29,689	64,080	66,822	77,185
Japan (yen)	2,640	2,810	3,739	6,864	7,305	9,721
Netherlands (guilder)	40.46	42.12	49.81	105.18	109.50	129.50
South Africa (rand)	42.43	42.29	32.21	110.30	109.94	83.74
Spain (peseta)	2,310	2,399	2,579	6,007	6,238	6,705
Sweden (krona)	118.96	121.26	130.38	309.28	315.24	338.96
Switzerland (franc)	28.80	30.63	36.33	74.87	79.62	94.46
UK (pound)	11.39	11.10	11.11	29.62	28.86	28.89
US (dollar)	17.00	17.00	15.75	44.20	44.20	40.95

TRANSACTION VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	per lb. U_3O_8 in Concentrates			per kg. U in Concentrates		
	This Month (Jul 31, 1986)	Last Month (Jun 30, 1986)	12 Months Ago (Jul 31, 1985)	This Month (Jul 31, 1986)	Last Month (Jun 30, 1986)	12 Months Ago (Jul 31, 1985)
Australia (dollar)	28.78	25.65	20.44	74.83	66.69	53.13
Belgium (comm. franc)	764.53	774.08	837.12	1,988	2,012	2,176
Canada (dollar)	24.20	23.88	19.94	62.93	62.08	51.83
Finland (markka)	87.85	88.16	87.23	228.39	229.20	226.77
France (franc)	119.86	120.70	126.83	311.62	313.80	329.72
FRG (mark)	36.94	37.87	41.68	96.04	98.45	108.35
Italy (lira)	25,373	26,005	27,804	65,965	67,608	72,284
Japan (yen)	2,718	2,843	3,502	7,066	7,391	9,104
Netherlands (guilder)	41.65	42.62	46.65	108.27	110.79	121.27
South Africa (rand)	43.67	42.79	30.16	113.54	111.23	78.42
Spain (peseta)	2,378	2,428	2,415	6,183	6,311	6,279
Sweden (krona)	122.46	122.68	122.10	318.38	318.95	317.44
Switzerland (franc)	29.65	30.99	34.03	77.07	80.56	88.46
UK (pound)	11.73	11.23	10.41	30.49	29.20	27.05
US (dollar)	17.50	17.20	14.75	45.50	44.72	38.35

[1]Calculated using currency exchange rates published in the *Wall Street Journal* on July 31, 1986.

©NUEXCO 1986

CONVERSION VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	per lb. U as UF_6			per kg. U as UF_6		
	This Month (Jul 31, 1986)	Last Month (Jun 30, 1986)	12 Months Ago (Jul 31, 1985)	This Month (Jul 31, 1986)	Last Month (Jun 30, 1986)	12 Months Ago (Jul 31, 1985)
Australia (dollar)	2.96	2.68	2.22	6.53	5.92	4.89
Belgium (comm. franc)	78.64	81.01	90.81	173.36	178.59	200.19
Canada (dollar)	2.49	2.50	2.16	5.49	5.51	4.77
Finland (markka)	9.04	9.23	9.46	19.92	20.34	20.86
France (franc)	12.33	12.63	13.76	27.18	27.85	30.33
FRG (mark)	3.80	3.96	4.52	8.38	8.74	9.97
Italy (lira)	2,610	2,721	3,016	5,754	6,000	6,649
Japan (yen)	279.55	297.52	379.87	616.29	655.92	837.46
Netherlands (guilder)	4.28	4.46	5.06	9.44	9.83	11.16
South Africa (rand)	4.49	4.48	3.27	9.90	9.87	7.21
Spain (peseta)	244.63	254.06	261.99	539.32	560.10	577.60
Sweden (krona)	12.60	12.84	13.25	27.77	28.30	29.20
Switzerland (franc)	3.05	3.24	3.69	6.72	7.15	8.14
UK (pound)	1.21	1.18	1.13	2.66	2.59	2.49
US (dollar)	1.80	1.80	1.60	3.97	3.97	3.53

SWU VALUE AND UF_6 VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	SWU Value delivery within one year (Jul 31, 1986)	UF_6 Value per kg.U in UF_6 This Month (Jul 31, 1986)	UF_6 Value per kg.U in UF_6 Last Month (Jun 30, 1986)
Australia (dollar)	128.29	79.36	71.96
Belgium (comm. franc)	3,408	2,108	2,171
Canada (dollar)	107.88	66.74	66.99
Finland (markka)	391.57	242.22	247.31
France (franc)	534.25	330.48	338.60
FRG (mark)	164.66	101.86	106.23
Italy (lira)	113,093	69,958	72,951
Japan (yen)	12,114	7,493	7,975
Netherlands (guilder)	185.63	114.83	119.55
South Africa (rand)	194.66	120.41	120.02
Spain (peseta)	10,601	6,557	6,810
Sweden (krona)	545.84	337.65	344.15
Switzerland (franc)	132.14	81.74	86.92
UK (pound)	52.28	32.34	31.51
US (dollar)	78.00	48.25	48.25

[1]Calculated using currency exchange rates published in the *Wall Street Journal* on July 31, 1986.

© NUEXCO 1986

NUEXCO

CURRENT MARKET DATA

RECENT TRANSACTIONS[1]

Uranium Sales

Nuexco Transaction Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current Exchange or UF_6 Value	Seller	Buyer	Remarks
3779	1987	101-300	108	Trader	Utility	UF_6.
3778	1986	less than 50	102	Producer	Producer	
3777	1987	101-300	109	Producer	Utility	UF_6.
3773	1986	101-300	100-102	R[5]	Utility	
3772	1986	101-300	100-102	R[5]	Utility	
3771	1986	101-300	R[5]	Trader	Utility	UF_6.
3760	1986	less than 50	112	Trader	Utility	UF_6.

[1]Transactions listed are not limited to those in which Nuexco was involved, but also include others of which Nuexco is aware.
[2]If tails assay is unknown or unspecified, Nuexco's calculation of SWU quantity assumes 0.20 w/o tails assay.
[3]Price is not normalized to 0.20% tails assay.
[4]Refers to SWU Value that corresponds to SWUs included in transaction. When prices and SWU values are expressed as discounts (e.g. X dollars less than DOE's USEC base price at time of delivery), the percentage refers to the ratio of the *discounts*, not the ratio of the prices.
[5]The notation *R* means that Nuexco either does not know, or that Nuexco has restricted that information to protect client confidentiality.

© NUEXCO 1986

URANIUM SUPPLY
(July 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U_3O_8) Spot or Near-term[2]	Intermediate or Long-term	Remarks
Available for Sale:			
ACTIVE			
2335	400	—	
2740	100	—	
2764	260	—	UF_6
2765	260	—	UF_6
2777	500	—	
2889	100	—	
2967	100	—	
2973*	15	—	
2989	40	—	
3010	400	300 per year	
3023	500	500	UF_6
3121	1,200	—	
2263	—	400 per year	1987 on
2625	—	500 per year	1987 on
2781	—	250 per year	1988-95
2927	—	220 per year	1987-90
2981*	—	600 per year	1988-91
TOTAL:	3,875		
INACTIVE			
2297	200	200 per year	1988-89
2336	250	250 per year	1987-94
2389	75	75 per year	1987-90
2703	750	—	
2810	195	175	UF_6
2813	30	—	
2853	65	—	
TOTAL:	1,565		

*New or revised since last month.

[1]Measured from the date of this Report.

[2]For delivery within one year. This category excludes material deliverable within one year under other than spot or near-term contracts.

Projects removed since last month: 2826.

© NUEXCO 1986

NUEXCO

CURRENT MARKET DATA

URANIUM DEMAND
(July 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U_3O_8) Spot or Near-term[2]	Intermediate or long-term	Remarks
Inquiries to Purchase:			
ACTIVE			
2681	500	500 per year	UF_6 or U_3O_8; 1988
2782	600	700	1988
2784*	100	—	
2928	450	—	
2934*	500	—	
2951*	250	100 per year	1987-91
2966*	200	—	
3072*	100	—	
2738	—	1,000	1989-on
2760	—	750 per year	1987-90
TOTAL:	2,700		
INACTIVE			
2661	250	250 per year	1986-87
2733*	500	—	
2798	70	—	
2857	—	300	1988-95
TOTAL:	820		

*New or revised since last month.
[1]Measured from the date of this Report.
[2]For delivery within one year. This category excludes material deliverable within one year under other than spot or near-term contracts.
Projects removed since last month: None.

©NUEXCO 1986

LOAN SUPPLY AND DEMAND
(July 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U_3O_8) Within 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
INACTIVE			
1938	2,000	—	UF_6
2036	500	—	
2667	800	—	
2920	2,000	—	
TOTAL:	5,300		

*New or revised since last month.
[1]Measured from the date of this Report.
Projects removed since last month: None.

No inquiries to borrow are reported this month.

© NUEXCO 1986

NUEXCO

CURRENT MARKET DATA

CONVERSION SUPPLY AND DEMAND
(July 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U as UF_6) Within 3 Years	Beyond 3 Years	Remarks
Available for Sale:			
ACTIVE			
2849	550	500	1987-90
2859	750	750	
2988	400	500	
TOTAL:	1,700		
Inquiries to Purchase:			
ACTIVE			
2833	400	—	
2974	165	—	
TOTAL:	565		

*New or revised since last month.
[1]Measured from the date of this Report.
Projects removed since last month: None.

©NUEXCO 1986

SWU SUPPLY AND DEMAND
(July 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of SWUs) Spot or Near-term[2]	Intermediate or Long-term	Remarks
Available for Sale:			
ACTIVE			
2571	—	55	1987
2855	250	—	
2873	40	—	
2953	200	—	
3026*	15	—	
TOTAL:	505		
INACTIVE			
2410A	340	—	
TOTAL:	340		
Inquiries to Purchase:			
INACTIVE			
2879	250	—	
2878*	60	—	
TOTAL:	310		

*New or revised since last month.
[1]Measured from the date of this Report.
[2]For delivery within one year. This category excludes SWUs deliverable within one year under other than spot or near-term contracts.
Projects removed since last month: 2914.

© NUEXCO 1986

ANALYSIS & COMMENTARY

STATUS OF DOE'S PROPOSED ENRICHMENT CRITERIA

Introduction

The Department of Energy has concluded its "Comment" period and established the final wording for the rulemaking it is conducting regarding proposed revisions to its criteria governing uranium enrichment. On July 24, DOE submitted the revised criteria to Congress, in the form of a proposed amendment to the US Code of Federal Regulations, to begin the mandatory 45-day review period. If Congress fails to pass legislation against the proposed rule during that period, the criteria will replace those currently in effect. This article serves as a follow-up to the article that appeared in Report 211 (March 1986, page 4); some of the details of the proposed criteria mentioned in that article have been subsequently altered. The following analysis examines the important details of the proposed criteria and their potential impact on the enrichment market, especially in light of the recent events in the lawsuit involving US uranium producers and DOE.

Background

The basis for the rulemaking procedure lies in the enactment of the Atomic Energy Act of 1954 and its subsequent amendments. The Private Ownership of Special Nuclear Materials Act, passed by Congress in 1964, permitted private ownership of fissionable materials in the USA. The 1964 Act also amended the 1954 Atomic Energy Act to include Section 161(v), authorizing the Atomic Energy Commission (DOE's predecessor) to "enter into contracts to provide...for the producing or enriching of special nuclear material..." [42 U.S.C. 2201(v)]. Furthermore, the section required the AEC to "establish criteria in writing setting forth the terms and conditions under which (enrichment) services...shall be made available." The Act required that the proposed criteria be submitted to Congress for a period of 45 days prior to the actual implementation of the criteria.

Section 161(v) included other important provisions:

1. "(DOE), to the extent necessary to assure the maintenance of a viable domestic uranium industry, shall not offer such (enrichment) services for source or special nuclear materials of foreign origin intended for use in a utilization facility within or under the jurisdiction of the United States."

2. "That prices for services...shall be established on a nondiscriminatory basis;"

3. "...any prices established under this subsection shall be on a basis of recovery of the Government's cost over a reasonable period of time." (As originally adopted, this provision stated that prices for enrichment services would be established on a basis of which would allow "reasonable compensation for the Government." After considerable Congressional debate over the plausibility of that language and the desire for a more effective means to recover the government's costs, the current version was adopted by Congress in 1970 as an amendment to the Atomic Energy Act.) The actual intentions of Congress when formulating the original language, along with subsequent committee reports and the 1970 amendment, have become important considerations in connection with the current dispute over the size of DOE's enrichment debt.

The Establishment of Criteria

Following the Congressional mandate in 1964 to establish criteria governing enrichment, the AEC formulated the Uranium Enrichment Services Criteria in December 1966, setting forth the terms and conditions for the sale of enrichment services. The criteria provided for different types of contracts (fixed-commitment, requirements-type, or a combination thereof), a total limitation on the enrichment of foreign uranium for use in US plants, delivery schedules, charges for services, and other specifications. Frequent revisions to these criteria followed:

1. The aforementioned 1970 Amendment to the Atomic Energy Act resulted in the AEC adoption, in March 1971, of criteria consistent with that amendment. The fundamental change to the criteria was in the language regarding the recovery of the government's costs.

2. In August 1973, the AEC again revised the criteria in order to prescribe the fixed-commitment contract (LTFC) as the primary form of DOE enrichment contract. This was done to assure the availability of enrichment capacity in later decades. In addition, this revision eliminated the requirement for a ceiling price for enrichment services.

3. In October 1974, the criteria were revised to phase out over a period of several years the restrictions on the enrichment of foreign-origin uranium for use in US reactors, an event that DOE believes to be relevant to the US producer-DOE litigation.

4. Minor changes to the criteria were implemented in revisions of June 1978 and May 1979. The current criteria have been in effect since 1979.

Impetus for Proposed Criteria Revisions

As a result of a major marketing initiative in early 1984, DOE began implementing a series of steps designed to bolster its declining worldwide enrichment market share. The first of these moves under the new "businesslike" strategy that DOE heralded during 1984 was the issuance of the Utility Services enrichment contract (USEC). The response to the new, requirements-based contract was very favorable. Contract negotiations took place throughout the summer of 1984, and, by the time all of the conversions to the USEC were completed, DOE had modified

©NUEXCO 1986

the conversion terms to provide concessions to each class of customer. As a result, the number of contract conversions exceeded even DOE's expectations.

However, many groups found fault with the DOE strategy in general and the USEC in particular. In December 1984, the General Accounting Office (GAO) released the results of its investigation into DOE's actions surrounding the issuance of the USEC. Among other points, the GAO study found that the guaranteed ceiling price of the USEC either conflicts with or is not specifically authorized in the present enrichment criteria. Moreover, the write-off of certain costs of the gaseous diffusion plants that DOE used in calculating the USEC SWU price may have been unlawful and inappropriate.

Also in December 1984, three US uranium producers filed a five-count lawsuit against DOE. Count II asserted that the new contract was invalid because its terms amounted to a change in the criteria governing enrichment, and, because the contract was not submitted to Congress for its mandatory review, it was not a valid contract. The following September, the US District Court in Colorado agreed with the producers. Judge J.R. Carrigan stated that the critical issue regarding the USEC was that it "...[amounted] to new criteria governing enrichment." He cited three examples:

1. Existing criteria require that the primary DOE enrichment contract must be of a Fixed-Commitment type, which the USEC clearly is not.

2. The USEC sets a ceiling price for enrichment services, which conceivably could prevent the government from recovering its costs. For the same reasons, the provision in the original criteria which guaranteed a ceiling price was eliminated by the aforementioned 1973 revision.

3. Provisions in the USEC that base termination penalties on the period of notice that the customer gives DOE, rather than on estimates of costs that will be incurred as a result of customer terminations, should be considered new criteria.

Faced with these and other criticisms, DOE began to formulate new criteria in an attempt to alleviate as many of these problems as possible in a single rulemaking procedure. Meanwhile, during 1985 it continued to announce broad moves designed to increase customer confidence in its new strategy. In short, these included two separate incentive-priced SWU campaigns in an attempt to secure as much of its customers' remaining requirements as possible; and DOE's announcements of concrete measures pertaining to its present and future performance and pricing schemes, including USEC base price reductions, a commitment to AVLIS deployment, and the cancellation of the gas centrifuge enrichment plant (GCEP) program.

The Proposed Criteria — January 1986

DOE's latest criteria revisions first appeared in a Notice of Proposed Rulemaking in the *Federal Register* (Vol. 51, No. 19) on January 29, 1986. The actual criteria consisted of fifteen subsections (762.1-762.15) covering many aspects of contracts, feed specifications, prices, costs, and other pertinent issues. Several pages of supplementary information, mostly consisting of DOE's rationale for the revisions and reasoning behind the exact language, preceded the proposed wording of the criteria. DOE requested written comments on the proposal by February 28, 1986, and held a public hearing on the matter in March. (See article on page 4 of Report 211 [March 1986] discussing several of the important points in that version of the proposed criteria.)

Once again, the GAO criticized DOE's strategy. In a legal opinion issued on February 19, the GAO stated, "... whatever the policy merits of (Department of) Energy's proposal, it cannot legally be accomplished through rulemaking." The GAO specifically took issue with three aspects of the proposed criteria:

— The modification that allows DOE flexibility in pricing and other contract terms without congressional oversight (Section 762.4);

— the changes that permit individually negotiated contracts rather than standard contracts (Sections 762.4 and 762.14), and;

— the "Nondiscrimination" criteria (Section 762.7).

In addition, the opinion expressed doubt that DOE had correctly and sufficiently addressed the problem of the viability of the US uranium industry in the proposed criteria. Section 762.3 — *Enrichment of Uranium of Foreign Origin* merely stated, "A domestic customer shall certify the country of origin of feed material delivered to DOE." Finally, the GAO stated that the changes in criteria conflict with established law and must be implemented through legislative action rather than a rulemaking procedure.

DOE issued a Notice of Additional Information which appeared in the *Federal Register* on April 25, 1986, providing for an additional written comment period of 30 days. DOE stated that it was responding to "requests for further analysis with respect to those provisions of the proposed uranium enrichment criteria which relate to (1) the 'enrichment of foreign origin uranium' and (2) the 'recovery of prior government costs.'" However, DOE noted that it had clearly discussed its position regarding enrichment of foreign-origin uranium in the preamble to the proposed criteria, adding that "interested persons have a more than sufficient basis on which to comment." Therefore, DOE would attempt to clarify only the cost recovery issue in the April Notice.

© NUEXCO 1986

ANALYSIS & COMMENTARY

Issuance of the Proposed Criteria — July 1986

On July 24, DOE's final wording of the criteria had been established and was submitted to Congress. It appeared in the *Federal Register* on July 29, 1986. (This version of the proposed criteria is reprinted on page 15 of this Report.) Prior to 1977, the Joint Committee on Atomic Energy (which consisted of members of both the House of Representatives and the Senate) provided oversight of AEC activities, including the review of uranium enrichment criteria. That committee was abolished in 1977, and although its functions have been assigned to other House and Senate subcommittees, no particular committees were specified. As of press time, it appears that the Senate Committee on Energy and Natural Resources (of which Senator Domenici is a member) and the House Comittee on Interior and Insular Affairs will be among the committees reviewing the proposed criteria. In addition, other Senate Committees — on Environment and Public Works, and Appropriations; and House Committees — on Energy and Commerce, Science and Technology, and Appropriations — may also ask to review the proposal.

In general, the proposed criteria submitted to Congress in July are not substantially different than the language issued for review and comment in January 1986. DOE stated that it had "considered all the comments carefully in its deliberations concerning the revised criteria and has modified the proposed criteria where appropriate." These modifications included the following.

1. *General* (§ 762.1) — Two additions to this section required that enrichment contracts must specify the customer's commitment to DOE to take services and the charge for cancellation of that commitment, and that contracts must be long term in nature, unless a short-term contract would "promote the objectives of the [Atomic Energy Act]."

2. *Enrichment of Uranium of Foreign Origin* (§ 762.3) — DOE removed the sentence requiring US customers to certify the country of origin of the feed material, replacing it with, "DOE may not restrict the enrichment of uranium of foreign origin for domestic use except to the extent it determines such a restriction is necessary to assure the maintenance of a viable domestic uranium industry." This new wording carefully ties the issue of industry viability with foreign uranium enrichment restrictions, giving DOE the perogative to decide whether restrictions will actually help the US industry. If DOE determines that restricting the enrichment of foreign uranium will not sufficiently revive the US production industry, it is not compelled to act. Indeed, DOE has already argued (with support from the US Trade Representative, among others) that enrichment restrictions will not necessarily assure the viability of the US industry. Predictably, the revision is consistent with the legal argument made by DOE with respect to Count I in the producers' lawsuit against DOE (see Report 215 [July 1986], page 3).

In an extensive argument in the *Supplementary Information* to the proposed criteria submitted to Congress, DOE notes the existence of the US District Court Injunction preventing it from enriching foreign-origin uranium for US use. (The injunction is currently stayed pending appeal.) However, DOE states that it "believes that the [District Court] judgment is erroneous." DOE adds, "In adopting section 762.3, DOE is mindful of the ongoing nature of the ... litigation. Section 762.3 is being adopted at this time, notwithstanding the ... litigation, in order to formally record DOE's interpretation of Section 161(v) (of the Atomic Energy Act), (and) to state DOE's determination that restrictions on enrichment of foreign-origin uranium continue to be inappropriate..."

3. *Recovery of prior unrecouped Government costs* (§ 762.6) — This section, which requires DOE to allocate a portion of enrichment revenues for the repayment of prior government costs, is closely related to Section 762.5 ("Costs"), which deals with DOE's cost recovery. Many comments DOE received on this section pertained to the various disagreements over the size of the enrichment debt to be recovered. Also, several members of the Senate Committee on Energy and Natural Resources objected to this section during the initial comment period because they believed it was inconsistent with federal deficit reduction measures (specifically, the Consolidated Omnibus Budget Reconciliation Act of 1985 [COBRA]). In response, DOE added the qualification, "DOE shall determine the amount to be returned to the US Treasury each year," and included several factors that are supposed to influence that determination. This addition would allow DOE considerable flexibility in determining repayments to the Treasury.

Potential Impact

Despite the fact that during the comment period DOE received comments on virtually every section in the proposed criteria, two issues stand out as the most controversial. Both of these issues are the subject of extensive Congressional interest, and either of them could prevent Congressional acceptance of the proposed criteria.

Most important is the cost recovery issue (§ 762.5), which has already prompted a vast range of criticism. While DOE values the enrichment debt at $3.4 billion, the GAO and the National Taxpayers Union (a lobbying group) assert that the actual figure is as high as $7 billion. Meanwhile, many US utilities and other parties believe that the actual debt is far lower than $3.4 billion. (Senator Domenici's legislation, if passed in its current form, ignores the actual amount of the enrichment debt, writing it down to only *$350 million* as of FY86.) This issue is

©NUEXCO 1986

one of the chief obstacles that may prevent DOE from securing Congressional approval for the proposed criteria.

The second major obstacle is DOE's stance regarding enrichment limitations on foreign-origin uranium for use in US plants. Senator Domenici's strong support of the domestic uranium industry and his influential political reputation may persuade many of his Congressional colleagues that DOE should take a more active role in assuring the existence of a thriving domestic industry, a position that DOE is clearly avoiding in its proposed criteria. Conversely, a large segment of Congress can be expected to align with the Reagan Administration's free-trade philosophy, disavowing any usage or enrichment limitations on foreign-origin uranium.

While before the various Congressional committees, DOE will likely be urged to make additional modifications, but it is doubtful that DOE will accede to such requests. If Congress cannot persuade DOE, it appears that Congress must pass legislation or at least adopt a joint resolution within the 45-day review period in order to prevent the proposed critiera from taking effect.

Relationship to the District Court Rulings

A US District Court ruling interpreting a federal statute will take precedence over an administrative rulemaking. Thus, if upheld in the Tenth Circuit Court of Appeals, Judge Carrigan's order requiring limitations on the enrichment of foreign-origin uranium for use in US reactors will take effect (absent further stays or appeals) regardless of any DOE rulemaking on that issue, or the presence of criteria which specifically prohibit limitations. Moreover, as part of his ruling, Carrigan ordered DOE to commence a rulemaking procedure to establish criteria consistent with his order. In essence, DOE ignored that order and proceeded with a rulemaking that was consistent with *its interpretation* of the relevant portions of the Atomic Energy Act that deal with assuring the viability of the domestic uranium industry. Whether DOE will be allowed the discretion to determine the point at which foreign-origin enrichment limitations are necessary depends not only on the Congressional acceptance of the proposed critiera, but also on DOE's success in the Tenth Circuit Court of Appeals. The hearing before the Tenth Circuit on Carrigan's ruling, both regarding enrichment limitations and the validity of the USEC, is scheduled to begin September 11, 1986.

The validity of the last section (§ 762.15) of the proposed criteria may also depend on the outcome of the producer/DOE litigation before the Tenth Circuit. Judge Carrigan ruled (as to Count II of the lawsuit) that certain terms contained in the USEC amounted to a change in the criteria governing enrichment, and, because there had been no Congressional review, the contract was null and void. "Prior Contracts" (§ 762.15) states that "All contracts under which DOE was providing enrichment services prior to the adoption of these criteria are valid. These prior contracts may be amended to conform to these criteria without penalty, if both parties agree." DOE received comments to the effect that this section was an improper attempt to retroactively validate the USEC following Carrigan's null and void ruling. However, DOE maintains that "a change in criteria should not invalidate existing contracts," and that the contracts were negotiated "in good faith between DOE and its customers." Again, DOE must prevail in the appeal process in order to successfully implement this section of the criteria.

NOTE: As of August 5, the US Senate had passed a joint resolution prohibiting DOE from submitting the proposed criteria. If the resolution is passed in the House of Representatives and signed by President Reagan, the proposed criteria will not take effect. It is likely that the joint resolution will be attached to a bill that Reagan is expected to sign without hesitation, such as the debt-reduction bill.

PART 762 - URANIUM ENRICHMENT SERVICES CRITERIA

Section

762. 1 General
762. 2 Definitions
762. 3 Enrichment of Uranium of Foreign Origin
762. 4 Prices
762. 5 Costs
762. 6 Recovery of Prior Unrecouped Government Costs
762. 7 Non-discrimination
762. 8 Amendment of Contract
762. 9 Termination by DOE
762.10 Termination by Customer
762.11 Quantities and Form of Feed and Product Material
762.12 Customer's Option to Acquire Tails Material
762.13 Responsibility for Material Meeting Specifications
762.14 Other Terms
762.15 Prior Contracts

Authority: Section 161(v) of the Atomic Energy Act of 1954, 68 Stat. 921 (42 U.S.C.§2201(v)).

§762.1 General.

(a) Authority. These criteria set forth the general terms and conditions applicable to the provision to civilian customers of uranium enrichment services in facilities owned by DOE, as authorized by the Atomic Energy Act of 1954, as amended (the Act). Specifically, these

© NUEXCO 1986

NUEXCO

ANALYSIS & COMMENTARY

criteria are established pursuant to Section 161(v) of the Act, which was added by Public Law 88-489, the "Private Ownership of Special Nuclear Materials Act."

(b) Eligible customers. DOE may enter into contracts for providing enrichment services with licensees and cooperative agreement customers. Enrichment services can be offered to cooperative agreement customers only while comparable services are available to licensees and cannot be offered for prices less than the prices for services to licensees.

(c) Capacity limitations. DOE will not enter into contracts in excess of the available capabilities of DOE. Available capability consists of inventories of material available or committed to DOE and the physical capability of existing and authorized enrichment plants, fully powered and operated without limitation as to mode of operation, but as reduced by potential commitments involving forecasts of Government needs.

(d) Sale limitations. Except as specifically provided, nothing in this notice shall be deemed to affect the sale or leasing of special nuclear material by DOE or the entering into "barter" arrangements whereby special nuclear material is distributed pursuant to Section 54 of the Act and source material is accepted in part payment therefor.

(e) Committed services. Contracts for the provision of enrichment services shall specify the extent to which a customer is committed to take services from DOE and the charge, if any, for not taking committed services.

(f) Duration. Contracts for the provision of enrichment services shall be long-term, except that DOE may offer short-term contracts if, in its view, such contracts would promote the objectives of the AEA.

(g) Revision of criteria. The criteria contained in this notice are subject to change by DOE from time to time; however, any such changes shall be developed in conference with applicable administrative guidelines and shall be submitted to the Committees of the Senate and House of Representatives which under the rules of the Senate and House have jurisdiction for review in accordance with the Act.

§762.2 Definitions.

(a) "Enrichment services" means the separative work necessary to enrich or further enrich uranium in the isotope U-235.

(b) "Cooperative agreement customer" means a person receiving enrichment services pursuant to an agreement for cooperation arranged pursuant to section 123 of the AEA.

(c) "Licensee" means a person licensed under sections 53, 63, 103 or 104 of the AEA.

(d) "Separative work" means the measure of the effort required to separate a quantity of uranium feed material into (1) an enriched fraction containing a higher concentration of U-235 than the feed material and (2) a tails fraction containing a lower concentration of U-235.

§762.3 Enrichment of uranium of foreign origin.

DOE may not restrict the enrichment of uranium of foreign origin for domestic use except to the extent it determines such a restriction is necessary to assure the maintenance of a viable domestic uranium industry.

§762.4 Prices.

DOE may negotiate prices in individual enrichment services contracts in accordance with an overall approach intended to maintain the long-term competitive position of DOE while obtaining the recovery of the Government's costs over a reasonable period of time.

§762.5 Costs.

DOE will establish charges for enrichment services on a basis that recovers appropriate Government costs over a reasonable period of time. Such costs will be determined on a basis that includes the costs incurred in providing enrichment services as follows:

(a) electric power and all other costs, direct and indirect, of operating the enrichment plants;
(b) depreciation of enrichment plants;
(c) costs of process development;
(d) cost of DOE administration and other Government functions in support of the Enrichment Program; and
(e) imputed interest on investment in plant, working capital, the natural uranium contained in those inventories at the DOE enrichment plants needed to provide enrichment services, and the separative work costs of preproduced inventories.

§762.6 Recovery of Prior Unrecouped Government Costs.

In establishing prices for providing enrichment services for civilian customers, DOE will establish reserves sufficient to return to the Treasury of the United States, over a reasonable period of time, previously unrecouped and unrecovered costs associated with provision of enrichment services to civilian customers. The estimate of such costs will include costs attributable to plant capacity used to provide enrichment services for civilian customers, but will not necessarily include costs attributable to plant capacity or other investments not properly allocable to the Government's costs associated with providing enrichment services to civilian customers. DOE shall determine the amount to be returned to the U.S. Treasury each year. In determining this amount, DOE shall consider all relevant factors, including the following:

(a) long-term financial integrity of the enrichment program;
(b) reliability of service at competitive prices;
(c) market share;
(d) impact upon existing enrichment facilities and other program expenditures;
(e) impact upon research and development; and
(f) need to reduce the deficit.

§762.7 Non-discrimination.

The same prices, as well as other terms and conditions, shall be available to all similarly-situated customers on a non-discriminatory basis, reflecting DOE's judgment of cost differentials associated with supplying enrichment services to different customers.

§762.8 Amendment of contract.

At the request of either DOE or the customer, the parties will negotiate and, to the extent mutually agreed, amend the contract without additional consideration. A contract may provide for renegotia-

©NUEXCO 1986

tion of prices, as well as other terms and conditions, at specified times or upon request by either party.

§762.9 Termination by DOE.

(a) The contract may be terminated by DOE without cost to DOE upon reasonable notice at such time as commercial enrichment services are provided by another domestic source: Provided, however, that DOE will upon request by the customer rescind any notice of termination and will continue to furnish the services specified in the contract if the services of the domestic source are not available to the customer; (1) to the extent provided for in the DOE contract during the remainder of its terms; and (2) on terms and conditions, including charges, which are considered by the DOE to be reasonable and nondiscriminatory.

(b) DOE may terminate the contract without cost to DOE in the event the customer loses its right to possess enriched uranium, or defaults on its contractual obligations, or becomes involved in bankruptcy proceedings where such involvement interferes with the customer's ability to perform its obligations. In such instances, the customer will be required to pay a termination charge determined as if the customer had terminated the contract.

§762.10 Termination by customer.

The contract shall provide the circumstances under which the customer may terminate the contract in whole or in part. Reasonable and appropriate charges for termination as are negotiated shall be specified in the contract.

§762.11 Quantities and form of feed and product material.

The form of feed and product material shall be UF-6, except where DOE and the customer agree to another form. The quantity of material to be furnished by the customer in relationship to the quantity of enriched uranium to be delivered by DOE and the related amount of separative work to be performed by DOE normally will be determined in accordance with the then current standard table of enrichment services published by DOE. DOE may agree to perform such services in accordance with such other table as is within its capability. DOE will not necessarily use the specific feed material or quantity of material furnished by the customer in producing the enriched uranium delivered to the customer.

§762.12 Customer's option to acquire tails material.

The customer shall be granted an option to acquire tails material (depleted uranium) resulting from the performance of enrichment services. The option as to quantity (kg U) of tails material desired by the customer, within the maximum quantity subject to the option, must be exercised at the time of delivery of the related quantity of feed material. The U-235 assay of the tails material delivered to the customer will be within the sole discretion of DOE. The maximum quantity of depleted uranium subject to the option will be equal to the difference between the total uranium supplied by the customer as feed material and the total enriched uranium furnished to the customer, less processing losses as established from time to time by DOE. Delivery of tails material will normally be at the same time as delivery of enriched uranium.

§762.13 Responsibility for material meeting specifications.

The customer warrants that all feed material meets specifications and, with stated exceptions, agrees to hold DOE and its representatives harmless from all damages, liabilities, or costs arising out of a breach of the warranty where such damages, liabilities, or costs are incurred prior to final acceptance of the feed material by DOE. However the customer is not deprived of any rights under indemnification agreements entered into pursuant to section 170 of the Act (Price-Anderson indemnification). DOE's obligation to furnish specification material to the customer terminates upon final acceptance of such material by the customer.

§762.14 Other terms.

A contract may contain terms and conditions not specified in these criteria, so long as the terms and conditions are not inconsistent with these criteria.

§762.15 Prior contracts.

All contracts under which DOE was providing enrichment services prior to the adoption of these criteria are valid. These prior contracts may be amended to conform to these criteria without penalty, if both parties agree.

©NUEXCO 1986

ANALYSIS AND COMMENTARY

NUCLEAR POWER PROJECTS AFTER CHERNOBYL IN THE FEDERAL REPUBLIC OF GERMANY

Introduction

Given the public opinion sensitivity of nuclear energy policies in many Western nations, the April 26, 1986 accident at the USSR's Chernobyl station is certain to hinder nuclear power development in the West. While the Soviet government insists that Chernobyl will not in any way alter Soviet nuclear power plans, the accident was followed in Europe by the deferral of planned reactors in the Netherlands and Finland and by an Austrian government announcement that the Zwentendorf plant definitely will not be allowed to operate.

However, the Western country likely to experience the most widespread difficulty in its nuclear industry is the Federal Republic of Germany (FRG), where construction and licensing of several projects was underway when the Soviet accident occurred. After years of gradually increasing acceptance under a moderately conservative federal government, nuclear energy has resurfaced as one of the more prominent issues in German politics.

Among the principal world users of nuclear energy, the FRG is comparatively vulnerable to the political effects of Chernobyl for a variety of reasons. In the USA, the effects of the accident have been limited, partly because it occurred in the USSR, but mostly because the US industry had already undergone a series of strict new regulations following the Three Mile Island accident. New pressure for industry changes is likely to focus on evacuation plans. In both France and Japan, a strong political consensus has long supported nuclear energy as a national economic imperative; that consensus is unlikely to be damaged seriously by events in other nations. The German nuclear industry, by contrast, has been troubled by widespread political opposition for many years, and despite that opposition the industry has continued to pursue projects that are prone to attack at each stage of the licensing process.

Vulnerable Projects

Currently, three light water reactors (LWRs) — Isar Unit 2, Emsland and GKN Unit 2 — are under construction in the FRG. Two other LWRs, Brokdorf and Muelheim-Kaerlich, are complete and in the midst of pre-commercial licensing (Table 1). The THTR 300, a prototype high-temperature reactor, received a license early this year to operate for 1,100 days at full power. The Kalkar Fast Breeder Reactor (FBR) in North-Rhine Westfalia, owned by German, Dutch, Belgian and British interests, is complete but delayed pending issuance of a fuel-loading license. Other facilities not yet installed or licensed include a proposed reprocessing plant at Wackersdorf in Bavaria, now in the groundbreaking stage; plans for the expansion of the Nukem and Alkem fuel fabrication facilities in Hessen; and an LWR planned at the Borken site in Hessen, for which permit applications were filed in 1985. All of these projects can be blocked legally through the denial of licenses by politically appointed ministers. Furthermore, some of the country's older units, such as Obrigheim, Wuergassen, Stade and Biblis A, may be vulnerable to political action if it can be demonstrated that the plants do not meet modern safety standards.

Thus far, the LWRs undergoing construction and licensing have been relatively unaffected by the recent surge of anti-nuclear sentiment, with the exception of Brokdorf. Located near the mouth of the Elbe River in Schleswig-Holstein, the new Kraftwerk Union plant has been a target of German intervenors since the late 1970s, when it was the site of violent mass demonstrations. Shortly after the Soviet accident, new demonstrations were organized, and the state government responded by announcing it would withhold a license to load fuel pending the outcome of an inquiry into plant safety. The state government is controlled by the Christian Democrat Party (CDU), which is supportive of the project, so a license may be granted as soon as the authorities detect a more receptive public mood. Nevertheless, to avoid confrontation, the delay could be extended through federal elections in January 1987, after which time the unit's future could be decided by the policies of a new federal government.

THTR Episode

The THTR in North-Rhine Westfalia experienced licensing delays for two years after fuel was initially loaded in August 1983, principally because it is the first commercial-sized unit of its type in Germany and its fuel system uses highly enriched uranium. The owner (Hochtemperatur-Kernkraftwerk GmbH, [HKG]) obtained a full-power license in early 1986 and the unit was undergoing power ascension when the Chernobyl accident occurred. On May 3, following rain showers in Germany, the level of radioactivity in the region of the THTR rose to 50,000 Becquerels per square meter (Bq/m^2). On May 4, a technician loading absorber spheres into the THTR fuel bed used helium-gas pressure from within the core to dislodge spheres that had jammed in the loading tube (Figure 1). As a result, a small amount of graphite dust and helium was discharged through an unfiltered sector of the unit's chimney. While no increase in radioactivity was detected in the region, HKG calculated that for a short time the level of radioactivity had increased by 0.1 Bq/m^2. The owner reported the incident to the state government, where the responsible under-minister confirmed that the discharge was insignificant.

News of the THTR discharge leaked to the public, and in late May the OKO Institute in southern Germany alleged that 60

©NUEXCO 1986

percent of the radioactivity in the region around the plant was due to the THTR itself rather than to the Chernobyl accident. The resulting public reaction brought the issue to the attention of the Minister of Economics for North-Rhine Westfalia, Reimut Jochimsen. Mr. Jochimsen claimed he had not been informed of the discharge, and on June 1, without consulting HKG, he ordered that the reactor remain shut down following a two-day outage, pending an investigation of the discharge incident. HKG immediately informed the minister that it had cleared the discharge with the minister's office, but the unit was not allowed to restart until July 20. HKG was ordered to take a number of precautions against any further discharges.

Table 1

NUCLEAR POWER UNITS IN THE FEDERAL REPUBLIC OF GERMANY

Lead Utility and Fuel Buyer	Unit	MWe	Type	COD	Percent Complete
BW/EVS	Philippsburg 1	864	BWR	1980	100
	Philippsburg 2	1268	PWR	1985	100
BAG	Grafenrheinfeld	1235	PWR	1982	100
	Isar 1	870	BWR	1979	100
	Isar 2*	1285	PWR	1988	70
GKN	GKN 1	795	PWR	1976	100
	GKN 2*	1230	PWR	1989	45
HEW	Brunsbuettel	771	BWR	1977	100
	Kruemmel	1260	BWR	1984	100
KWO	Obrigheim 1	328	PWR	1969	100
PE	Wuergassen	640	BWR	1972	100
	Stade	630	PWR	1972	100
	Unterweser	1230	PWR	1979	100
	Grohnde	1290	PWR	1985	100
	Brokdorf*	1290	PWR	1986	100
RWE	Biblis A	1146	PWR	1975	100
	Biblis B	1240	PWR	1977	100
	Gundremmingen B	1244	BWR	1984	100
	Gundremmingen C	1244	BWR	1985	100
	Mülheim-Kaerlich*	1227	PWR	1986	100
SBK	Kalkar*	295	LMFBR	1987	95
VEW	THTR 300	296	HTR	1986	100
	Emsland*	1242	PWR	1988	60
Total		22,920			

*Unit under construction or licensing

BW = Badenwerk AG
BAG = Bayernwerk AG
EVS = Energieversorgung Schwaben AG
GKN = Gemeinschaftskernkraftwerk Neckar GmbH
HEW = Hamburgische Elektricitaetswerke AG
KWO = Kernkraftwerk Obrigheim GmbH
PE = Preussenelektra AG
RWE = Rheinisch-Westfaelisches Elektrizitaetswerk AG
SBK = Schnell-Breuter Kernkraftwerksgesellschaft mbH
VEW = Vereinigte Elektrizitaeswerke Westfalen AG

© NUEXCO 1986

The Plutonium Issue

The Kalkar FBR is located west of the THTR in North-Rhine Westfalia and has been subjected to more obstacles from the state's governing Social Democrat Party (SPD). In the case of Kalkar, Mr. Jochimsen has stated unequivocably since the Soviet accident that he will deny any further licenses leading to operation of the finished plant. Technically, the minister's intransigence may be overcome by the intervention of the federal government in Bonn, as the law governing licensing of nuclear facilities allows the federal government authority to direct a state government to grant a license. There is no precedent for such action, however, and there is sufficient ambiguity in the regulations that a state could delay such an order by conducting inquiries into technical aspects of a project. Moreover, such a decision by the federal government to order a state to act in support of a nuclear facility could have damaging political implications for the ruling coalition. The Kalkar situation is unlikely to change at least until federal elections are held in January 1987.

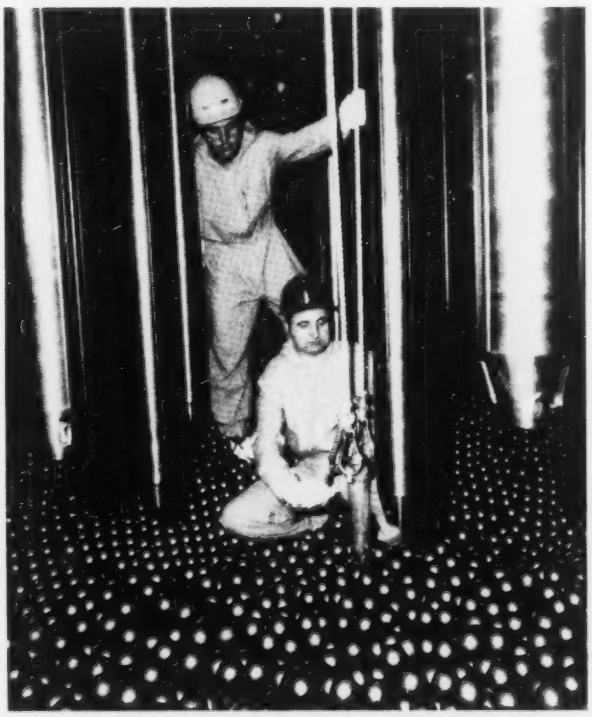


Figure 1. Reactor core of THTR during initial loading (1983), showing fuel spheres and control rods.

The position of the SPD (the main opposition party in German politics) regarding Kalkar reflects an anti-plutonium policy that has become more strictly defined since Chernobyl. The Soviet accident challenged all parties to clarify their positions toward nuclear energy. The SPD responded with ambiguous words about the desirability of phasing out nuclear power altogether, and strong words calling for the rejection of a plutonium economy, including the FBR and domestic reprocessing. Thus, in addition to Kalkar, two companies in the German nuclear fuel cycle have been threatened by the SPD — Alkem, the fabricator of FBR fuel assemblies, and DWK (Deutsche Gesellschaft fuer Wiederaufarbeitung von Kernbrennstoffen mbH), the national reprocessing and spent fuel disposal company.

DWK received a license from the state of Bavaria in 1985 to begin construction of the Wackersdorf reprocessing plant, and groundwork has proceeded since last autumn, amid widespread action by intervenors. Recently, a massive concrete wall was built around the plant site to discourage further obstruction. The state government of Bavaria, known as the most conservative government in the FRG, has not yet wavered in its support of the project. Conversely, in Hessen, the state of the Alkem facility, the SPD governs in coalition with the vehemently anti-nuclear Green party. As part of the coalition arrangement, a member of the Green party holds the office of Minister of Environment in the state government, and has some control over the licensing of nuclear facilities. Any future applications to expand fuel cycle facilities in Hessen, such as Alkem's request to store plutonium commercially on site, are certain to be rejected by the current government.

Threat of SPD/Green Coalition

The principal fear of the German nuclear industry is that the anti-nuclear government coalition existing in Hessen will spread to other states or, at worst, to the federal government. The likelihood of such a development depends on German voters' willingness to accept a "Red-Green" coalition, and on the ability of the SPD and Green parties to establish a working alliance. In elections on June 15 in Lower Saxony, the SPD and Greens together failed to gain a majority in the state legislature by the margin of only one seat, indicating the worst results in 19 years for the conservative parties (CDU and the Free Democrat Party [FDP]) in Lower Saxony. Many voters distrust the Green Party's ecological extremism, and that sentiment undoubtedly contributed to the narrow victory of the conservatives. The SPD itself has repeatedly distanced itself from the Greens; however, it has also demonstrated that it will compromise with them in order to hold power. Internally, the Greens are divided over the integrity of an alliance with the SPD, and the party is closely watching the power-sharing arrangement in Hessen to determine

©NUEXCO 1986

if there is any real advantage to such a compromise.

One of the most important tests of the tenability of the SPD/Green coalition will be the state government's action against the nuclear power industry. The Green Party Minister, Mr. Fischer, recently called for the shutdown of RWE's Biblis station, siting a report his staff researched that the power from Biblis is not needed. (The two-unit Biblis plant is the only operating nuclear power station in Hessen; the Kahl reactor was shut down for decommissioning in 1985.) The Green Party has threatened to abandon the coalition government if the SPD does not take measures to implement Mr. Fischer's plan prior to the end of 1986. Thus, the SPD will be forced to arrange a settlement satisfactory to the Greens or risk the formation of a new government in Hessen. The SPD's maneuvering will be particularly significant because its timing may influence the outcome of the federal elections. Currently the SPD holds the most seats of any single party in the German federal parliament, but a coalition of the CDU, CSU (Christian Social Union) and FDP has a controlling majority of some 30 seats.

Conclusion

The electoral power of the anti-nuclear sentiment raised by Chernobyl will not actually be tested until the next federal elections in January 1987, and until then several projects either planned or in development by the German nuclear industry will probably not advance. By then, the major political parties will have further articulated their policies and tested the strength of possible coalitions. At present it seems clear that the SPD will adopt an anti-nuclear platform, including at the least the abandonment of Kalkar and Wackersdorf, and possibly including other cuts to appeal to the ecological Left, such as the retirement of one or more old reactors and a call for the gradual phase-out of nuclear power. There will almost certainly be pressure within the governing coalition, particularly from the CDU, to take concrete steps to moderate the current pro-nuclear policies. Finally, it is entirely possible that the government will withdraw support for one or more controversial projects in a simple effort to retain power.

©NUEXCO 1986

NUEXCO

UPDATE

1986 US NUCLEAR PLANT LICENSING PROGRESS

During the first half of 1986, five nuclear units in the USA began commercial operation. The number of operating reactors (including those in the final licensing process) has reached 99, and total installed generating capacity in the USA is approximately 90,000 MWe. Table 2 lists the units that have entered commercial operation in 1986, as well as the units with full-power licenses which are scheduled for commercial service in the near future. Using Nuexco estimates, a cursory examination of the inventory situation of the five utilities that have brought units into commercial service thus far in 1986 indicates that, on average, those utilities hold uranium inventories equivalent to approximately seven times the annual U_3O_8 requirements of the units entering commercial service.

Licensing progress for new nuclear plants in 1986 is moving at about the same pace as in 1985, when eight units entered commercial operation. According to utilities' estimates, 18 reactors were scheduled to enter service in 1986, but Nuexco expects that only seven of those units will actually achieve that status. Both of Pacific Gas and Electric Company's Diablo Canyon units are now in commercial operation; Unit 1 began in May 1985 and Unit 2 began in March 1986. In addition, Arizona Public Service might be able to bring both of its first two Palo Verde units into service during 1986. Unit 1 entered the rate base in February 1986, and Unit 2 has a full-power license and is in the midst of power ascension.

In other developments, the premature criticality that occurred during the startup of Detroit Edison Company's Fermi Unit 2 a year ago has delayed the unit's commercial operation. Although the Nuclear Regulatory Commission recently voted to reinstate the operating license for the 1,100-MWe BWR, it is currently restricted to five-percent power. Detroit Edison has not scheduled a commercial operation date.

After receiving a full-power license, Duke Power Company expects its Catawba Unit 2 to begin commercial operation by the end of September 1986. If it does, the 1145-MWe PWR will have begun operation nine months ahead of schedule and at a cost that the utility estimates to be far below the US average for comparable units. Catawba Unit 1 began commercial service in June 1985. The utility's success is completing a unit under budget and well before its scheduled completion date represents an encouraging sign for the development of the US nuclear power program.

Table 2

US NUCLEAR UNITS ENTERING COMMERCIAL OPERATION OR HAVING FULL-POWER LICENSES IN 1986

Unit	Utility	Net MWe	Type	COD[1]
Entered Commercial Operation				
Three Mile Island 1[2]	General Public Utilities	819	PWR	Jan 1986
Limerick 1	Philadelphia Electric	1055	BWR	Feb 1986
Palo Verde 1	Arizona Public Service	1270	PWR	Feb 1986
Diablo Canyon 2	Pacific Gas and Electric	1106	PWR	Mar 1986
Millstone 3	Northeast Utilities	1150	PWR	Apr 1986
Has Full-Power License				
River Bend 1	Gulf States Utilities	940	BWR	Aug 1986
Catawba 2	Duke Power Company	1145	PWR	3Q 1986
Palo Verde 2	Arizona Public Service	1270	PWR	late 1986
Perry 1	Cleveland Electric	1205	BWR	late 1986
Fermi 2[3]	Detroit Edison	1100	BWR	
Hope Creek	Public Service Electric & Gas	1067	BWR	late 1986

[1]Actual or Expected Commercial Operation Date.

[2]Three Mile Island Unit 1 re-entered the rate base at the end of 1985.

[3]Fermi Unit 2 has a full-power license, but is restricted to five-percent power pending NRC review. Detroit Edison has not scheduled an expected commercial operation date.

©NUEXCO 1986

AUSTRALIA

The biennial National Labor Party Conference held in early July failed to produce any significant changes in Australia's strict uranium policy. A motion by the left wing of the Labor Party to halt all mining and export of uranium was defeated by a vote of 57 to 40, and the current government's policy was endorsed as expected. That policy provides for mining and export from existing uranium operations (Queensland Mines Ltd.'s Nabarlek and Energy Resources of Australia's Ranger in the Northern Territory), but prohibits development of any new projects other than the Olympic Dam (Roxby Downs) uranium-copper-gold project in South Australia.

The Australian government ban on uranium sales to France also remains in effect pending resolution of the dispute over France's nuclear weapons testing in the South Pacific. Although the ban was officially declared in early 1983 and re-affirmed at the Labor Party Conference in July 1984, it did not become effective until September 1984, when new shipments were due under the Queensland Mines (QML) contract with Electricite de France (EDF).

The contract was negotiated in 1981 and calls for 6.8 million pounds U_3O_8 to be delivered between 1982 and 1988. Subsequently, the Australian government agreed to purchase eight shipments from Queensland Mines from September 1984 to September 1986, totaling 1.6 million pounds U_3O_8. Because the ban remains in place, the government will likely be forced to purchase additional quantities of QML's uranium that had been destined for sale to EDF.

While a minority of the Labor Party continues to promulgate anti-uranium attitudes, it is increasingly clear that even the left wing has adopted a more pragmatic approach to the uranium issue, notwithstanding the Chernobyl accident in the USSR. There appears to be greater recognition of the economic importance of uranium exports, as well as greater acceptance of the argument that Australia's participation in the market is necessary in order for it to have significant influence on uranium and related nuclear non-proliferation issues. Moreover, the continuing influx of capital from a variety of organizations (including French, German, Canadian, and Japanese interests) for exploration and property acquisition reflect an international belief in the eventual rationalization of Australia's uranium policy.

Nevertheless, more uncertainties regarding further development of the Australian uranium industry have emerged as a result of the ongoing legal dispute between the US DOE and the US uranium producers. If the US producers eventually prevail in their attempts to ban or significantly limit US utility use of non-US origin uranium, the timing of ERA's expansion and the Olympic Dam startup may have to be reexamined. The subsequent loss or shrinkage of US market share would be one aspect of the problem; perhaps more serious would be the increased competition from existing suppliers resulting from the reduced demand for non-US origin uranium. Thus, the Australian industry's interest in the outcome of the current legal proceedings in the USA may well equal that of the Canadian uranium industry, whose world market share exceeds 30 percent and whose development programs are further advanced than those in Australia.

SOUTH AFRICA

Second-quarter production from Chamber of Mines' producers amounted to 2,892,000 pounds U_3O_8, a three-percent decline from the previous quarter (Table 3).

Production at most of the mines fell slightly, although Driefontein Consolidated recorded a 16-percent increase, and production increased ten percent at Hartebeestfontein. Nuexco expects 1986 uranium production in South Africa to total approximately 12.4 million pounds U_3O_8.

Although the South African economy showed signs of strengthening in the first few months of 1986, that trend has been reversed by international reactions to the state of emergency that

Table 3

REPUBLIC OF SOUTH AFRICA:
1986 URANIUM PRODUCTION[1]
(Thousands of Pounds U_3O_8)

Operation	First Quarter 1986	Second Quarter 1986	Year to Date
Buffelsfontein	353	300	653
Driefontein Consolidated	41	49	90
ERGO[2]	91	88	179
Harmony	231	211	442
Hartebeestfontein	238	264	502
JMS[3]	318	305	623
Randfontein	339	324	663
Stilfontein (Chemwes)	137	135	272
Vaal Reefs	1,082	1,069	2,151
Western Areas	155	147	302
TOTAL[4]	2,983	2,892	5,875

[1]Excludes Palabora Mining Company, which is not a member of the Chamber of Mines.
[2]ERGO = East Rand Gold and Uranium Company Ltd.
[3]JMS = Free State Joint Metallurgical Scheme.
[4]Columns may not add due to rounding.

© NUEXCO 1986

was recently reimposed. In February 1986, representatives from South Africa and its major international creditor banks reached an agreement outlining the short-term rescheduling of the nation's large debt. A similar agreement with several hundred smaller banks was reached in March. The rand responded to these measures, rising steadily from the all-time low recorded in early December 1985. However, continued violence and social unrest, followed by the reimposition of the state of emergency and increased media attention, has contributed to the rand's recent decline. Although restrictive government actions may lead to further labor unrest, including the possibility of additional mine strikes, the large uranium stockpiles held by producers will continue to keep supply channels open for the foreseeable future. Moreover, gold exports currently account for about forty percent of South Africa's exports. Thus, the importance of mining revenues to the South African economy dictates that gold, and therefore uranium, production will certainly continue.

CORRECTION

The article on page 8 of last month's Report (#215, July 1986) contained two errors regarding the enrichment status of US utilities. Rochester Gas and Electric Company should have been included in Table 1 as one of the utilities that signed the Utility Services Contract. Also, the text stated that "five US utilities (including one utility group) are not covered by the USEC." However, as Table 1 correctly showed, one of the Yankee group utilities, Public Service Company of New Hampshire, did sign the USEC; the other three Yankee utilities did not.

© NUEXCO 1986

THE RABBIT LAKE PROJECT

Introduction

The Rabbit Lake uranium project is located on the eastern edge of Athabasca Basin in northern Saskatchewan (Figure 2). The discovery of uranium at Rabbit Lake in 1968 was the first discovery in one of the world's richest uranium districts. That discovery was the start of extensive and highly competitive prospecting and exploration activity along the trend of the Wollaston fold belt. The activity quickly spread throughout the entire region of the Athabasca Basin, resulting in subsequent discoveries of at least 25 separate uranium occurrences, 17 of which are located along the Wollaston trend, ranging from Key Lake at the south end to Eagle Point at the north end. The district holds some of the largest and highest-grade uranium deposits found in the world.

History of the Project

Gulf Minerals Canada Limited, a subsidiary of Gulf Oil Corporation, discovered the Rabbit Lake occurrence in late 1968, the first year of active exploration in the area. Subsequent drilling indicated the presence of a major uranium deposit. Gulf sold a 49-percent interest in the project to Uranerz Canada Ltd., in 1970. Construction of a mine and mill complex began in 1972, and initial U_3O_8 production began in 1975. The project was designed for a ten-year life, with production capabilities of 4 to 5 million pounds U_3O_8 annually. Gulf continued to explore the area surrounding Rabbit Lake and by 1980 had discovered the West Bear, Horseshoe and Raven orebodies to the south of Rabbit Lake, and the Collins Bay A, B, D and Eagle Point orebodies to the north of Rabbit Lake (see Figure 2).

Eldorado Nuclear Limited purchased 100-percent interest in the Rabbit Lake project in October 1982. The project was immediately turned over to Eldor Mines, a division of Eldorado Resources Limited. (The latter is a wholly-owned subsidiary of Eldorado Nuclear Limited. Another wholly-owned subsidiary, Eldor Resources Limited, controls 16.67 percent of the Key Lake project. Figure 3 illustrates these ownership relationships.) Eldor Mines continued mining and milling at Rabbit Lake and initiated further exploration and evaluation of the Collins Bay and Eagle Point deposits. Eldor ceased mining the Rabbit Lake deposit in September 1984; the mill continued to process stockpiled ore through March 1986. However, from mid-1985 to March 1986, ore sent to the mill was blended with stockpiled ore from the Collins Bay "B" deposit to produce a more uniform feed.

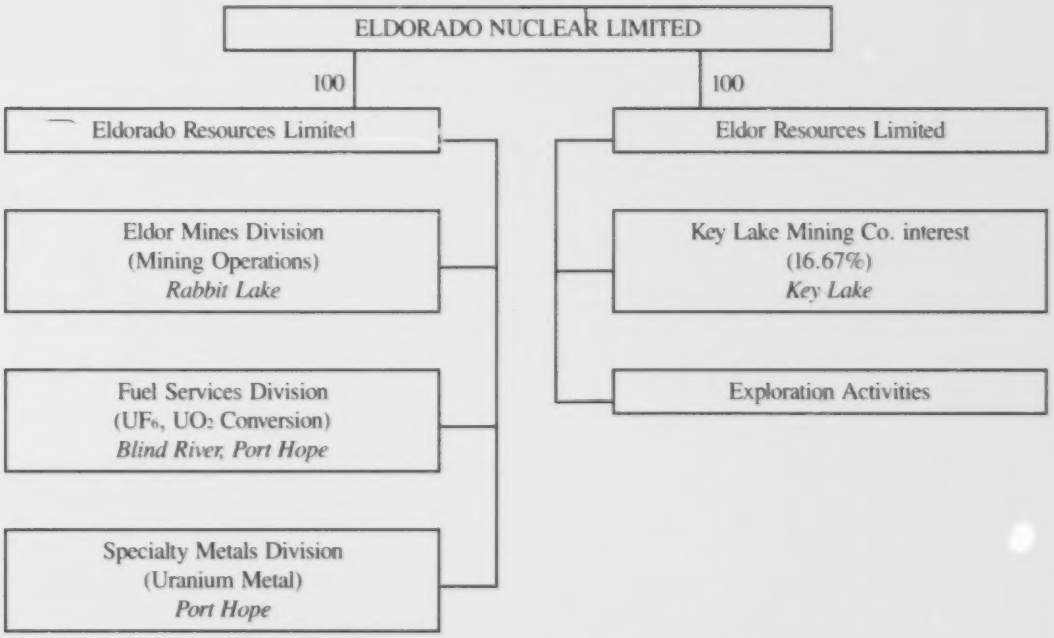


FIGURE 3. OWNERSHIP STRUCTURE OF THE ELDORADO GROUP

©NUEXCO 1986

NUEXCO

RAW MATERIALS

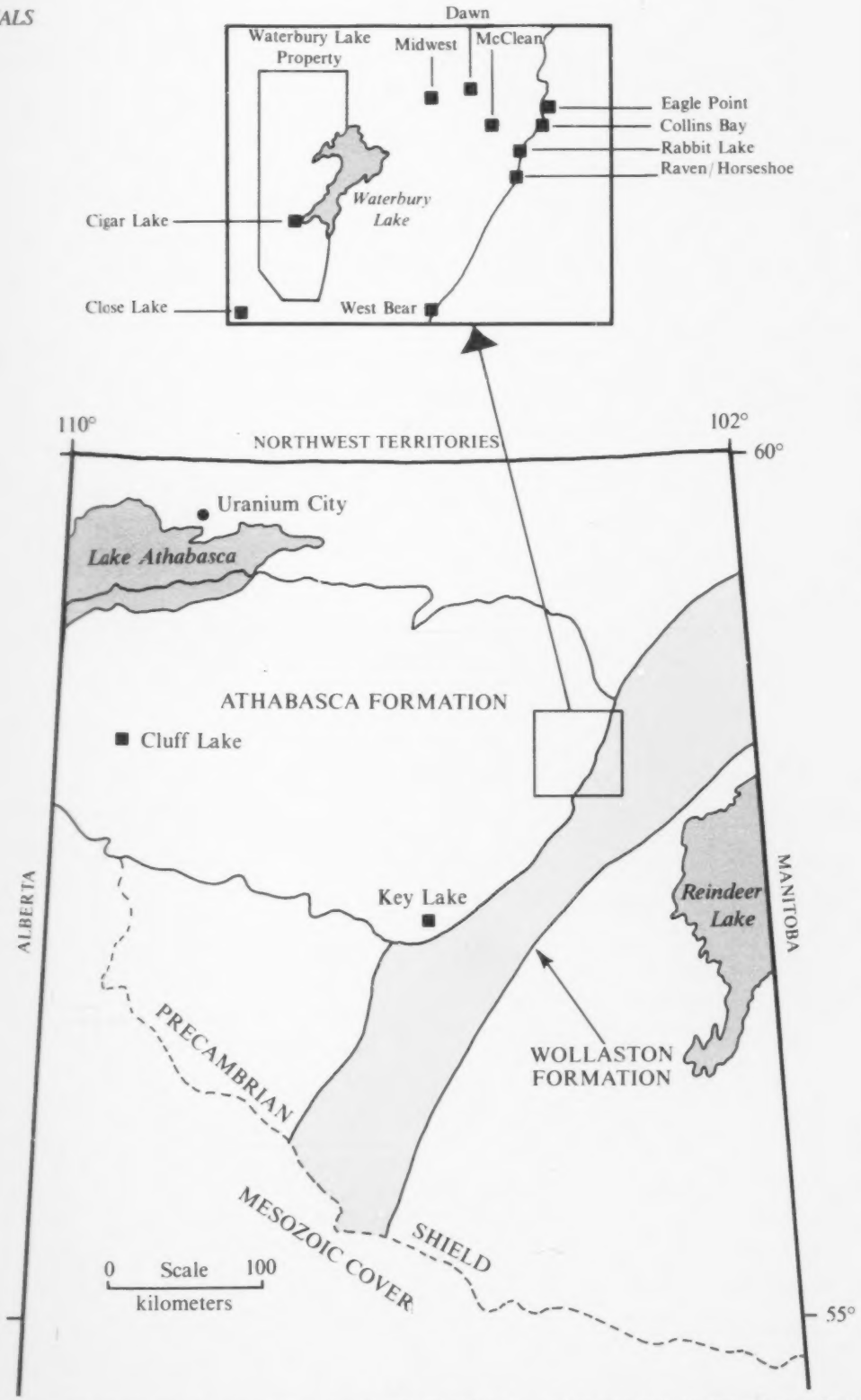


Figure 2. Location map of northern Saskatchewan, showing the Rabbit Lake project area and other uranium projects in the district.

©NUEXCO 1986

reserves and accessibility of those orebodies is likely to add another 10 to 12 years of life to the mining and milling project. The reserve estimates for the deposits are illustrated in the following table:

Orebody	Estimated Metric Tons of Uranium	Average Grade in Percent	Estimated Total in Pounds U_3O_8
"B" deposit	11,110	0.62	29,000,000
"A" deposit	6,500	5.68	17,000,000
"D" deposit	2,150	2.19	5,600,000
	Total estimated reserves =		51,600,000

The three deposits are situated along the northeast-trending Collins Bay thrust fault (Figure 4). The "D" orebody is about 450 meters northeast of the "B" orebody, and the "A" orebody is an additional 1.5 kilometers to the northeast. Geologically, the position occupied by each orebody is controlled by reverse faulting and related alteration associated with the unconformity between rocks of the lower Athabasca Formation of Helikian age (1,800 to 1,450 million years) and underlying rocks of the Wollaston Group of Aphebian age (2,200 to 1,800 million years). The Wollaston Group unconformably overlies Archean basement rocks. The footwall of the thrust zone consists of metasediments, made up primarily of granitoid gneiss; the hanging wall consists of graphitic gneiss. Both units belong to the

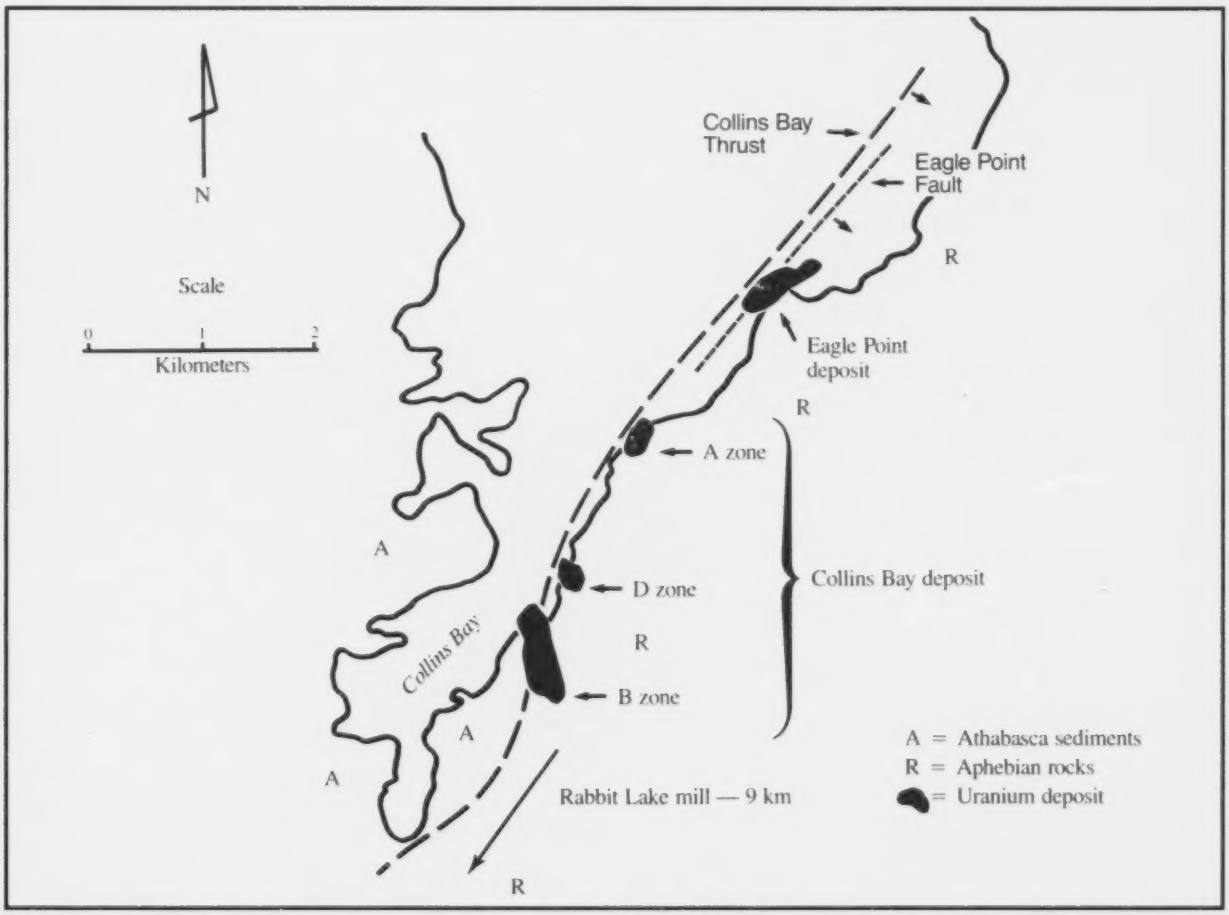


Figure 4. Geologic position of the Collins Bay and Eagle Point uranium deposits along the Collins Bay thrust and Eagle Point fault. (After Sibbald, 1983.)

©NUEXCO 1986

Wollaston Group. Ore deposits are situated on both sides and within the thrust zone, usually within the faulted remnant of the Athabasca Formation. However, mineralization may also occur in thin and highly altered segments of Aphebian rocks.

The actual host rock for the three Collins Bay orebodies is the Manitou Falls Formation, the lowest segment of the Athabasca Group that is present locally. Uranium mineralization is associated with a zone of intense argillic alteration and may extend downward to occupy the upper part of the regolith alteration zone at the Aphebian/Helikian contact. A halo of nickel mineralization shows close association with the uranium.

The mineral-forming process in the district followed deposition of the Athabasca sediments. Mineralization accompanied a period of widespread hydrothermal activity and associated rock alteration predated by regional tectonics and metamorphism of older rocks. Mineral accumulations occurred under favorable host conditions related to continued rock deformation and alteration. The age of mineralization is estimated at about 1,100 to 1,340 million years.

The "B" Orebody

Final evaluation and preparation of the "B" orebody was completed and stripping initiated in March 1985, and the first ore was mined and stockpiled in May. Mine production is currently progressing ahead of schedule, both in terms of tonnage mined and the average grade of ore. The "B" orebody is located nine kilometers northeast of the Rabbit Lake mill. It was discovered in 1977 by Gulf Minerals Canada Ltd., following detailed geological and geophysical studies in the immediate vicinity of the "A" orebody, discovered in 1971. Continued evaluation by geophysical techniques and diamond drilling on a number of electromagnetic conductors leading from the "A" zone led to the discovery.

Drilling revealed that the important zone of mineralization measured approximately 3000 feet long, 100 to 400 feet wide (average width is 300 feet) with an average thickness of about 100 feet. The bulk of the ore is in sandstone of the Manitou Falls Formation. The highest grade ore (2 to 4 percent U_3O_8) occurs in association with a clayey alteration product derived from Aphebian and basement rocks which were thrust, or squeezed, into the Manitou Falls sandstone. Rock alteration accompanied by high-grade ore is more pronounced where the mineral zone makes a sharp bend to the northeast at the north end of the deposit.

The orebody actually consists of a series of layered high-grade lenses enclosed by lower-grade ore. The high-grade material is usually confined to altered clay zones. Massive pitchblende is the main uranium mineral present in the clays; niccolite is the main source of nickel arsenides. However, the bulk of mineralization is confined to interstitial fillings and coatings of quartz grains in the sandstone. The main uranium minerals are pitchblende and coffenite; nickel arsenides present are gersdorffite and niccolite. Galena, chalcopyrite and pyrite are less common associated minerals.

Eldor is mining the "B" orebody using open-pit methods. Approximately 20 million tons of waste and ore will be removed, leaving a pit about 900 meters in length, up to 400 meters in width, and 60 to 70 meters in depth. The overburden, which was removed in 1985, consisted of a mantle of muskeg and glacial till 12 to 20 meters thick. It was removed and stockpiled separately for reuse around the site and final reclamation of the pit.

About 150 meters of the north end of the deposit extend into Collins Bay, covered by about 6 meters of water and 12 meters of glacial till. Dikes were installed to allow mining access to the ore (Figure 5). The main portion of the dike was constructed of interlocking steel sheet dam cells, each filled with compacted sand. Earthen dike extensions onshore, isolating the orebody from bay waters. Once the water had been pumped out, strip mining began.

The ore zone is so completely altered that mining is accomplished with little or no blasting, although ripping may be necessary. The mine rate is 1,800 tonnes of ore per day using front-end loaders for closer grade control. The mined ore is hauled from the pit using the same 27-tonne dump trucks and stockpiled nearby according to estimated grade. It is blended from stockpile to maintain a suitable yellowcake production level.

The "A" Orebody

Gulf Mineral Resources discovered the "A" orebody in 1971 during geologic reconnaissance of anomalous radioactivity in glacial material. Ground exploration led to the discovery of a mineralized boulder train; subsequent geophysical studies and follow-up drilling resulted in the ore discovery. The orebody is situated on the hanging wall of the Collins Bay thrust. It is entirely within highly altered Manitou Falls Formation immediately above the contact with Aphebian rocks and Archean granitoid and graphitic gneisses and metasediments (Figure 6). The orebody host is a lens of well-developed clay alteration. A halo of nickel mineralization surrounds the uranium mineralization.

The orebody measures about 90 meters along the thrust, 45 meters wide and only 30 meters in depth. The highest-grade uranium occurs in the center of the deposit as lenses and seams of pitchblende in hard dark clay; ore intercepts grading up to 80 percent U_3O_8 have been recovered from drill cores of this zone. Coffenite is present as a companion mineral in the lower-grade zones. Ore quality and quantity decreases with depth and completely bottoms out after penetrating about 6 meters into altered basement rock. Nickel arsenides (niccolite and rammelsbergite)

© NUEXCO 1986

are dispersed throughout the uranium, but show higher concentrations in areas of softer clays which are peripheral to the high-grade core. Traces of silver, gold and galena have been noted throughout the orebody. Uranium is the only mineral present in sufficient quantities to be of commercial interest.

The "A" orebody will be strip mined on a schedule favorable to the mining of the "B" orebody. The high-grade nature of the deposit will be beneficial to later-stage mining of the "B" orebody. The north end of the deposit extends into Collins Bay and will require the construction of dikes before mine development begins. Water depth and the thickness of the glacial till are similar to those conditions at the "B" orebody. The timing of the development is still under construction.

The "D" Orebody

The "D" orebody is the smallest of the three deposits included in the Collins Bay project. Nevertheless, it is important to the overall program. It is a small but high-grade deposit, can be strip mined with ease and is located in close proximity to the mill. Some diking may be necessary to develop the deposit fully. The mining schedule will probably coincide closely with that of the "A" orebody.

The "D" and "A" orebodies are structurally, geochemically and morphologically similar deposits. The largest part of the "D" orebody occurs in alteration clays and sandstone within the Manitou Falls Formation, all on the hanging wall of the Collins Bay thrust. It is about 120 meters long, 7 to 42 meters wide and about 28 meters thick. Minor amounts of ore occur in fragments of altered Aphebian and Archean rocks that have pushed into the Manitou Falls. In the sandstone portion, pitchblende and nickel arsenides occur as intergranular fillings and coatings of sand grains. Pitchblende forms as massive pods and vein-filling material. Massive pitchblende with niccolite is more common to the clay zones. Other minerals present in minor amounts include uraninite, coffenite, gersdorffite, galena, chalcopyrite, pyrite and graphite.

Figure 5. Photograph of overburden being stripped following the completion of dike construction on the Collins Bay "B" deposit.

©NUEXCO 1986

As of January 1986, Eldorado Resources' reserve position totaled an estimated 130,000,000 pounds U_3O_8 in the Collins Bay and Eagle Point South deposits alone. Its acquisition of the Rabbit Lake project and the highly successful drilling results led Eldorado Resources to initiate a C$100,000,000 program to modify the mill to process Collins Bay ores, develop the "B" orebody, prepare the mined-out Rabbit Lake pit to receive mill tailings, and complete evaluation and future development of the remaining orebodies. That program is proceeding — additions to the mill are now almost fully operational, all mill tailings are sent to the pit, and mining of the "B" orebody has progressed ahead of schedule. The status of ore reserves, combined with the size of the expenditure, indicates a project life of approximately another 25 years. Eldorado is now one of the world's largest uranium producers, having an annual capacity of 6,000,000 pounds from the Rabbit Lake project and about 2,000,000 pounds from its share of Key Lake production.

Project Format

Eldorado's modifications to the Rabbit Lake mill had a dual purpose — to maximize uranium recovery from the more complex and higher-grade Collins Bay ores, and to maintain new, more stringent environmental standards. The latter was accomplished primarily by eliminating the use of ammonia in the solvent extraction ion-exchange circuit and in the precipitation circuit. In the ion-exchange circuit, all uranium is now extracted (stripped) from the pregnant aqueous solution by the addition of strong sulfuric acid (450 g/l) rather than ammonia sulfate. The straight acid leach and strip action facilitates better extraction of Collins Bay "B" ore, which has a lower carbonate content than did Rabbit Lake ore. Yellowcake precipitation is accomplished with the addition of hydrogen peroxide instead of ammonia.

Mill waste water is treated with ferric sulfate and barrium chlorate to adjust the pH. It is then pumped to the settling pond area for final pH adjustment and removal of the last traces of radium. The overflow seeps through three separate sand filters before being released to the environment; radium-contaminated water is recycled through the mill.

The average grade of mill feed from the "B" orebody will approximate 0.60 percent uranium, compared to Rabbit Lake ores that averaged 0.35 percent. This permits a decrease in mining and crushing requirements. Reduced mill throughput requires less pumping capacity in the countercurrent decantation circuit (CCD), so lower-capacity pumps were installed for greater efficiency.

Impurities in Collins Bay ores include zircon, vanadium, molybdenum, iron and arsenic, compared to the occasional presence of molybdenum in Rabbit Lake ore. All impurities are precipitated out of the uranium-bearing solution by the addition of ferric sulfate and lime (about 250 pounds per ton) while passing through the solvent extraction circuit. Precipitated impurities are returned to the tails stream for final disposal. The commercial recovery of associated minerals is impractical due to poor yields of the other minerals, as well as their radium contamination. A large part of plant modification focused on tails preparation and permanent disposal. The uranium-free liquid stream (raffinate) from the solvent extraction circuit and the residue from the countercurrent decantation circuit (CCD) are neutralized with lime before being mixed and pumped to a newly constructed filter plant. Recovered fluids are recycled back to the mill; the filter cake is transferred to tailings disposal.

The tailings disposal plan is unique to the Rabbit Lake project. The mined-out Rabbit Lake pit is believed to be large enough to hold all tailings that may be generated during the remaining life of the project. Pit preparation began with the collaring of a tunnel into the southwest wall at the bottom of the pit for dewatering the pit. The tunnel was back-filled with large boulders, and the entire pit bottom was covered with a mantle of boulders. A five-foot thick layer of gravel was applied and covered with about ten feet of clean sand to form a multi-layered pervious envelope. The gravel and sand mantle will be layered up the pit walls as the pit fills with tailings, protecting the interior from outside forces.

The purpose of the gravel and sand pervious envelope is to contain all contaminants associated with mill tailings, allowing water in the tails to filter through the sand and flow through the gravel to the dewatering tunnel at the pit bottom. Similarly, migrating groundwater and surface water that would normally flow into the pit will flow down the gravel liner to the drain area, never making contact with the tailings inside the sand liner. The shaft contains three pump columns for lifting the water to the surface. Water recovered from the pit is recycled through the mill.

The transportation of tails from the filter plant to the pit was originally accomplished by loading the stacked filtercake on trucks and dumping the material directly into the pit. A new plan under development may accelerate the movement of material and allow greater control of the flow into the pit. The moisture content of filtercake is increased slightly to create a semi-liquid that will flow through a 10-inch pipeline leading from the end of the conveyor belt to a control point at the edge of the pit. At that point, the tailings flow into the pit is directed to create an even fill-up rate. If this method proves successful, permanent facilities will be installed.

The Collins Bay Project

The stripping and mining operations of the "B" orebody at the Collins Bay project are well underway. Project plans also include exploitation of the "A" and "D" orebodies. The combined

© NUEXCO 1986

Eagle Point Project

The most recent discovery in the area was made at Eagle Point, located on Collins Bay about 12 kilometers northeast of the Rabbit Lake mill (and about 5 kilometers northeast of the "B" orebody). The Eagle Point deposit was discovered in 1980 during a diamond drilling program designed to test the northeast extension of the Collins Bay thrust zone. High-grade mineralization was discovered on the southeast side of the thrust, and was followed southeast where the Eagle Point fault was discovered.

Exploration and delineation drilling during the next four years outlined an orebody estimated to contain about 130 million pounds U_3O_8. The orebody dimensions are currently about 1,130 meters in length, 185 to 400 meters in width, and extend from the surface to a drilled depth of about 400 meters. Approximately 80 percent of the orebody lies directly under 10 to 15 meters of water in Collins Bay.

The deposit is divided into Eagle Point South, which is 100 percent controlled by Eldorado and contains an estimated 78 million pounds U_3O_8; and Eagle Point North, controlled equally by Eldorado, Saskatchewan Mining Development Corporation (SMDC), and Noranda Mines Limited and contains an estimated 52 million pounds. Eldorado is the operator of the joint-venture project. The entire property, but primarily Eagle Point South, is included in the long-range planning for the Rabbit Lake project.

Uranium at Eagle Point is closely associated with the Eagle Point fault, a parallel structure to the Collins Bay thrust which is located only about 45 meters to the northwest. The highest grade uranium mineralization (up to 60 percent U_3O_8) occurs as fracture fillings and as impregnations in large lenses of highly altered gneissic and intrusive rocks adjacent to the fault zone. However, uranium mineralization occurs in all rock types influenced by fault-related fracturing and rock alteration. The actual fault zone, which is only 1.5 to 3 meters wide, is filled with graphitic gouge containing only spotty mineralization. Important uranium minerals present include pitchblende and uraninite. Boltwoodite, and alteration product of uraninite, is widely distributed throughout the deposit, and coffenite occurs in minor amounts. The nickel arsenides and associated minerals common to the A, B and D deposits occur only in trace amounts in the Eagle Point deposit.

Development plans for Eagle Point are uncertain at present. It is likely that the deposit will be mined completely by underground methods because most of the deposit is under water. The next phase of planning calls for review of engineering proposals for underground exploitation. Mining will coincide with the depletion of the three Collins Bay deposits in order to maintain established production schedules, indicating that a full-scale development program could be initiated within six to eight years.

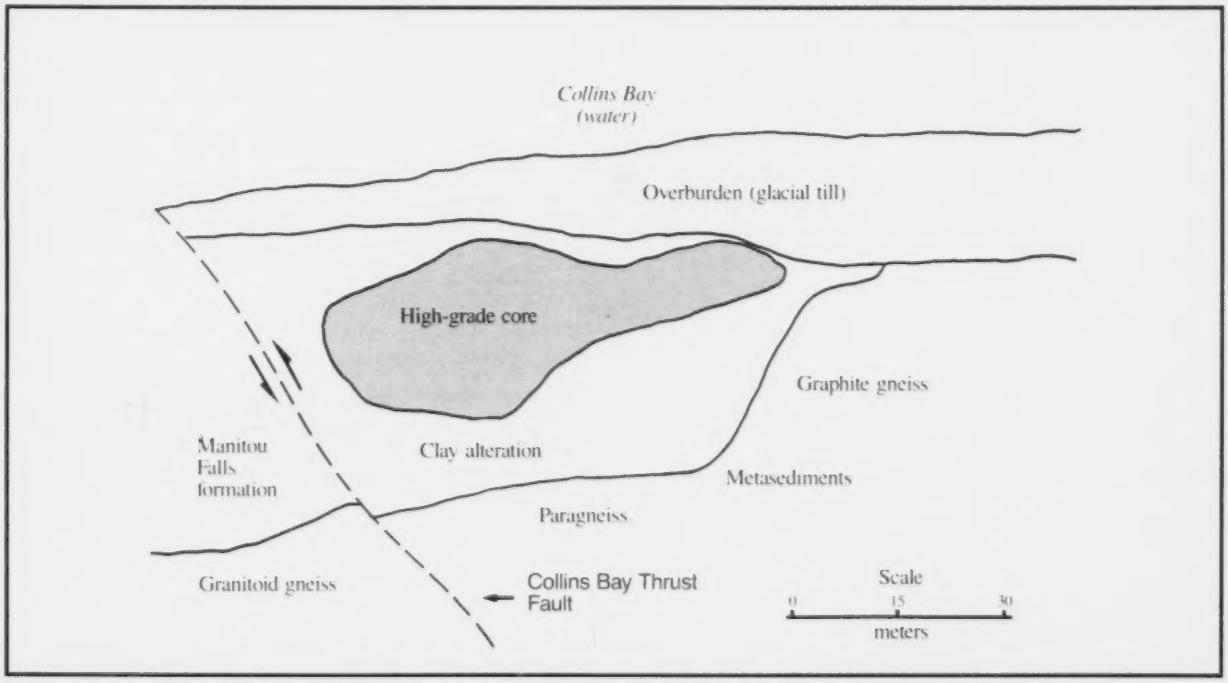


Figure 6. Vertical cross-section through the high-grade portion of the "A" orebody, showing relationship of the core to the clay alteration zone. (After Jones, 1980.)

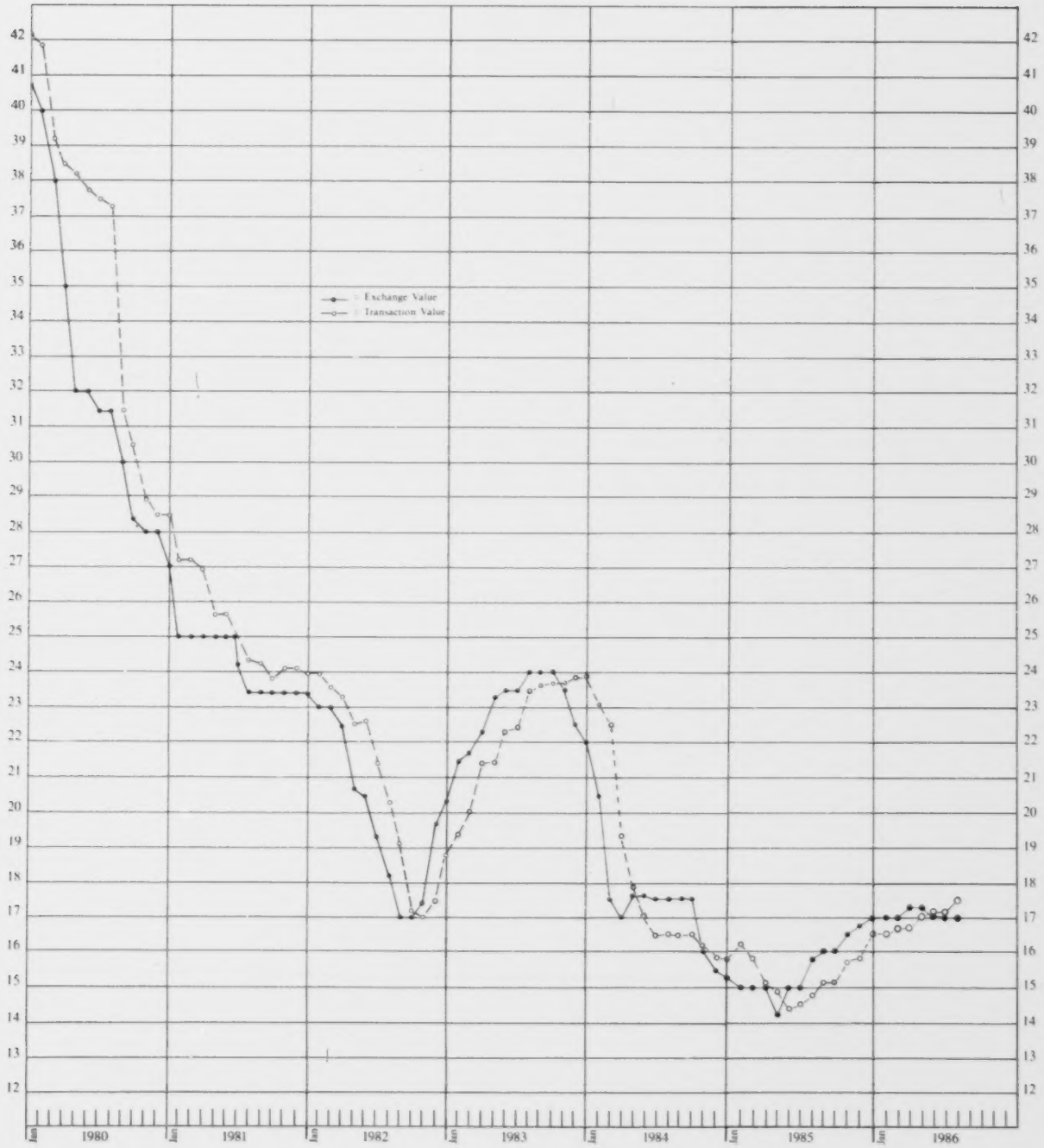
© NUEXCO 1986

NUEXCO

HISTORICAL MARKET DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1980

Determined as of the last day of the month indicated



©NUEXCO 1986

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	32.50	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	42.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	**17.00**					

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	**17.50**					

HISTORICAL CONVERSION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U in UF_6)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.80	1.90	1.80	1.80	**1.80**					

© NUEXCO 1986

NUEXCO

GOVERNMENT STATISTICS

AUSTRALIA

	Price Index of Materials Used in Manufacturing Industry — All Groups[1] (1984 = 100)	Award Rates of Pay Indexes Australia — Adult Males In Mining Wage Earners, Weekly Rates[2] (1976 = 100)
1975 Avg.	150.4	132.6
1976 Avg.	168.4	160.9
1977 Avg.	192.0	179.0
1978 Avg.[3 4]	198.5	190.0
1979 Avg.	248.8	127.9
1980 Avg.	321.8	140.8
1981 Avg.	355.3	154.1
1982 Avg.[5]	368.6	174.9
1983 Avg.	401.6	181.8
FY84 Avg.[6]	95.3	—
FY85 Avg.[6]	100.0	—
Jan 1985	97.0	197.8
Feb 1985	98.6	197.8
Mar 1985	102.1	197.8
Apr 1985	104.4	202.8
May 1985	107.6	202.4R
Jun 1985	108.7	202.4R
Jul 1985	111.1	202.4R
Aug 1985	110.5	202.4R
Sep 1985	108.9	202.4R
Oct 1985	108.7	202.4R
Nov 1985	109.6	209.8R
Dec 1985	110.2	209.9R
Jan 1986	109.8	209.9R
Feb 1986	108.9	209.9R
Mar 1986	99.7	209.9R
Apr 1986	94.5P	209.9R
May 1986	—	209.9

P = Preliminary R = Revised since last month

[1]Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0). The basis of this index was revised to 1984 = 100. The previous index was 1969 = 100.

[2]Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[3]Monthly data for 1970-78 appear on pages 4.7 and 4.8 of Report 138.

[4]Annual averages prior to 1979 reflect index base no longer in use.

[5]Monthly data for 1979-82 appear on page 35 of Report 184.

[6]Annual averages are for financial year ending June 30.

©NUEXCO 1986

CANADA

	Industry Selling Price Index: All Commodities[1] (1981 = 100)	Wage-earner Data: Average Hourly Earnings (C$)[2]					
		Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells[3] (SIC 051-099)	Primary Non-ferrous Metal Industries[4] (SIC 296)	(SIC 298)	Chemicals and Chemical Products[5] (SIC 372-379)
1979 Avg.[6]	217.9	—	9.60	9.66	—	—	7.67
1980 Avg.	247.2	—	10.58	10.80	—	—	8.50
1981 Avg.	288.7	—	12.02	12.23	—	—	9.53
1982 Avg.[7]	288.8	—	13.74	13.92	—	—	10.63
1983 Avg.	298.8	—	—	14.30	—	—	11.17
1984 Avg.	310.9	17.88	—	15.07	12.28	10.49	11.76
Jan 1985	117.5	18.05	16.13	15.60	12.32	10.80	12.04
Feb 1985	117.7	18.78	16.41	15.68	12.52	11.05	12.06
Mar 1985	118.4	18.24	16.21	15.57	12.44	10.97	12.02
Apr 1985	118.3	18.63	16.44	15.80	12.81	11.23	12.04
May 1985	118.6	19.41	16.51	15.63	12.76	11.25	12.15
Jun 1985	118.6	18.49	16.20	15.49	12.89	11.14	12.14
Jul 1985	118.6	18.14	16.27	15.41	12.96	11.17	12.13
Aug 1985	118.4	17.07	16.03	15.30	12.97	11.31	12.19
Sep 1985	118.6	18.53	16.55	15.72	12.95	11.39	12.26
Oct 1985	119.0R	18.74	16.51	15.70	13.14	11.53	12.33
Nov 1985	119.3R	19.05	16.66	15.88	12.76	11.32	12.49
Dec 1985	120.0R	19.07	16.57	16.01	12.51	11.09	12.59
Jan 1986	121.0R	18.15	16.22	15.86	13.11	11.48	12.52
Feb 1986	120.8R	19.52	16.57	15.99	13.20	11.59	12.45
Mar 1986	120.3R	19.04	16.65R	15.93R	13.11	11.59	12.54
Apr 1986	119.7	19.38	16.68R	15.95R	13.07R	11.64R	12.54R
May 1986	119.0	19.54P	16.66P	15.78P	12.92P	11.72P	12.38P

P = Preliminary R = Revised since last month

[1]Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Index prior to 1985, 1971 = 100.

[2]Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours" (Catalogue 72-002).

[3]Reports 175 through 185 list this series title incorrectly as "Metal Mining, Including Milling (SIC 050-099)."

[4]Beginning with the April 1983 figure, Primary Metal Industries, non-ferrous is split into SIC 296 and SIC 298.

[5]Chemical and Chemical Products prior to April 1983 was SIC 370-379. The new series is from a new survey which includes all companies and is based on a 1970 classification. The old survey only included companies of 20 employees or more.

[6]Monthly ISPI for 1977 and 1978 appear on page 4.10 of Report 138, and monthly wage-earner data for 1973-78 appear on page 4.11 of Report 138.

[7]Monthly data for 1979-1982 appear on page 37 of Report 184. On that page, the wage earner index entitled "Metal Mining, Including Milling (SIC 050-099)" should read "Total Mining (SIC 051-099)."

[8]Beginning with the March 1983 figure, Wage Earner Data are based on a census of all companies employing 200 or more wage earners, *plus* a random survey of companies employing fewer than 200 wage earners. Prior to March 1983 only companies employing 200 or more wage earners are included in the Wage Earner Data.

©NUEXCO 1986

NUEXCO

GOVERNMENT STATISTICS

REPUBLIC OF SOUTH AFRICA

		Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled (March 1982 = 100)[2]	Consumer Price Index[3] (1980 = 100)[4]	Producer Price Index All Groups[5] (1980 = 100)	Total Employment in Mining and Quarrying (Code 35)[6]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[6]
1975	Avg.	16.71	—	157.2	100.0	639,473	1,003,617
1976	Avg.	19.30	—	174.7	115.1	671,240	1,212,983
1977	Avg.	23.87	—	194.4	130.0	712,006	1,420,670
1978	Avg.	27.14	—	137.2	142.7	664,571	1,537,169
1979	Avg.[7]	30.18	—	155.3	164.5	692,209	1,830,632
1980	Avg.[8]	35.53	—	176.7	192.1	714,379	2,279,615
1981	Avg.	41.89	—	206.5	218.3	728,506	2,820,505
1982	Avg.[9]	47.25	104.2	233.5	248.7	707,552	3,246,071
1983	Avg.	51.87	115.0	262.2	274.8	696,579	3,644,772
1984	Avg.	58.95	130.3	292.8	297.9	712,080	4,196,764
Jan	1985	—	—	177.1	166.6	711,366	376,777
Feb	1985	—	—	182.8	171.3	727,932	361,823
Mar	1985	64.48	142.4	183.6	173.0	708,809	371,380
Apr	1985	—	—	187.4	174.0	724,187	369,005
May	1985	—	—	189.5	177.7	708,085	373,478
Jun	1985	67.42	148.9	191.9	179.2	724,587	395,543
Jul	1985	—	—	193.6	180.7	738,228	419,106
Aug	1985	—	—	195.6	183.2	734,121	416,777
Sep	1985	70.47	155.3	197.8	184.8	732,836	419,883
Oct	1985	—	—	200.8	188.1	720,071	401,448
Nov	1985	—	—	203.4	196.0	750,049	432,996
Dec	1985	72.43	160.1	207.4	199.4	741,372	425,261
Jan	1986	—	—	213.8	203.6	744,070	449,513
Feb	1986	—	—	215.8	206.9	754,458	438,562
Mar	1986	75.76	167.8	218.3	206.9	760,932	446,475
Apr	1986	—	—	222.2	208.9	—	—
May	1986	—	—	222.6	212.5	—	—
Jun	1986	—	—	224.4	—	—	—

[1]Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.

[2]Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3]Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[4]The basis for calculation prior to January 1985, 1975 = 100. For annual averages prior to 1978, April 1970 = 100.

[5]Previously known as the Wholesale Price Index, now the Producer Price Index. The computation remains the same. The basis for calculation prior to January 1985, 1975 = 100.

[6]Bulletin of Statistics, Department of Statistics, Pretoria.

[7]Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Report 140.

[8]Monthly data for Codes 35 and 40, 1977-1980, appear on page 28 of Report 157.

[9]Monthly data for 1979-82 appear on page 39 of Report 184.

©NUEXCO 1986

UNITED STATES

	Producer Price Index[1]		Consumer Price Index[2]	GNP Implicit Price Deflator[3,4]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[5]			
	Industrial Commodities (1967 = 100)	All Commodities (1967 = 100)	(1967 = 100)	(1982 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980 Avg.[6]	274.8	268.8	246.8	178.64	10.26	10.63	8.30	6.94
1981 Avg.	304.1	293.4	272.4	195.51	11.55	11.98	9.12	7.62
1982 Avg.[7]	312.3	299.3	289.1	207.15	12.33	12.94	9.96	8.21
1983 Avg.	315.8	303.1	298.4	215.63	12.57	13.43	10.59	8.65
1984 Avg.	322.6	310.3	311.1	108.1	13.05	13.43	11.08	9.04
Jan 1985	322.9	309.5	316.1	—	13.29	13.70	11.39	9.33
Feb 1985	322.5	309.2	317.4	—	13.30	13.73	11.39	9.33
Mar 1985	322.6	308.7	318.8	110.4	13.29	13.95	11.37	9.39
Apr 1985	323.8	309.3	320.1	—	13.43	13.63	11.47	9.40
May 1985	325.3	309.8	321.3	—	13.24	13.60	11.44	9.39
Jun 1985	324.8	309.2	322.3	111.3	13.23	13.68	11.51	9.46
Jul 1985	324.4	309.0	322.8	—	13.45	13.83	11.59	9.47
Aug 1985	323.7	307.3	323.5	—	13.55	13.71	11.60	9.50
Sep 1985	322.3	305.5	324.5	112.1	13.44	13.68	11.65	9.54
Oct 1985	324.2	307.9	325.5	—	13.49	13.66	11.70	9.55
Nov 1985	324.7	309.5	326.6	—	13.49	13.97	11.80	9.61
Dec 1985	325.1	310.2	327.4	113.0	13.43	13.81	11.85	9.68
Jan 1986	233.8	308.9	328.4	—	13.40	13.69	11.86	9.60
Feb 1986	318.9R	304.4R	327.5	—	13.44	13.82	11.81	9.60
Mar 1986	314.0	300.3	326.0	113.5R	13.38	13.93	11.78	9.62
Apr 1986	311.3	297.9	325.3	—	13.54R	13.87R	11.82R	9.62R
May 1986	311.7	299.2	326.3	—	13.44P	13.78P	11.88P	9.64P
Jun 1986	311.6	298.9	327.9	114.1R	—	—	11.90P	9.62P

P = Preliminary R = Revised since last month

[1]US Bureau of Labor Statistics, Washington, D.C.: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2]US Bureau of Labor Statistics, Washington, D.C.: Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3]US Department of Commerce, Washington, D.C.: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4]The basis for calculation of this index was revised to 1982 = 100. 1984 and 1985 figures have been adjusted to that basis. The basis for calculation prior to 1984, 1972 = 100.

[5]US Bureau of Labor Statistics, Washington, D.C.: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[6]Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Report 154.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

[7]Monthly data 1979-1982 for all listed indices appear on page 41 of Report 184.

©NUEXCO 1986

NUEXCO

REPRESENTATIVES AND CONSULTANTS

JAPAN

Kazy Yokota
Japan Tech Services
Ohkura Building (3F)
1-4-10 Shiba Daimon
Minato-ku, Tokyo, Japan
Telephone: (81-3) 431-6031, 6025
Telecopy: (81-3) 434-6674
Telex: 242-5060 (JATECH J)

SOUTH AFRICA

Chris I. Von Christierson
Southern Prospecting (Pty) Limited
P.O. Box 61409
Marshalltown 2107
Republic of South Africa
Street Address:
10th Floor
Eagle Star House
70 Fox Street
Johannesburg 2001
Telephone: (27-11) 838-1868
(27-11) 834-4211
Telecopy: (27-11) 834-3148
Telex: 4-89878 SA

TAIWAN

Edward Bee
Bee & Liang Company, Ltd.
14 FL Universal Business Center
NO. 663, Tun Hwa South Road
P.O. Box 1396
Taipei, Taiwan R.O.C.
Telephone: (886-2) 704-9630
TWX: 785-11570 (BEELIANG)

UNITED STATES

Harold C. Lindberg
83-A Hardee Lane
Whispering Pines, N.C. 28327
Telephone: (919) 949-3622

SPECIAL CONSULTANTS

George J. Stathakis
International Investment Banking

James C. C. Stewart
U.K. Nuclear Industry

W. Bryan Webster
International Business Development

J. Robert Wolcott
International Business Development